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SUMMARY OF THE 1996 U.S. NORTH AND SOUTH PACIFIC ALBACORE TROLL FISHERIES

By

John Childers and Forrest R. Miller

ADMINISTRATIVE REPORT LJ-97-07

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SUMMARY OF THE 1996 U.S. NORTH AND SOUTH PACIFIC ALBACORE TROLL FISHERIES*

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INTRODUCTION

Pacific albacore (*Thunnus alalunga*) is targeted by fisheries from a variety of nations (Tables 1 and 2). Landings data from these various fisheries are available from 1952 to the present year. U.S. troll vessels have fished for albacore in the North Pacific since the 1920's and annually take less than 20% of all albacore caught in the North Pacific. Collection of logbook and length-frequency data from the U.S. North Pacific albacore troll fishery began in 1974, while data collection from the U.S. South Pacific fishery began in 1987, just after that fishery's inception. The agencies involved in the collection of logbook, length-frequency, and landings information from the U.S. albacore troll fisheries are the Southwest Fisheries Science Center (SWFSC) of the National Marine Fisheries Service (NMFS), Western Fishboat Owners Association (WFOA), Pacific States Marine Fisheries Commission (PSMFC), and the state fisheries agencies of California, Oregon, and Washington. The fishing areas of the North Pacific fishery have shifted northward during the past 40 years. Larger troll vessels with increased carrying capacity and range have joined the North Pacific fleet and fishing areas have expanded west of the International Dateline. In recent years the North Pacific season has begun as early as mid-April, in areas northwest of Hawaii between latitudes 30°N and 40°N. In July and August, most of the fleet fish near 45°N, 150°W and along the West Coast from Vancouver Island to California. Fishing can continue into November when weather permits and sufficient amounts of albacore remain available to troll gear. Exploratory troll fishing for albacore in areas east of New Zealand in 1986 resulted in the development of the U.S. South Pacific troll fishery that began in 1987 (Laurs et. al., 1987). This fishery takes place during the austral summer months (December through April). U.S. troll vessels that participate in the South Pacific fishery depart from the West Coast or Hawaii after the end of the North Pacific season and travel to American Samoa or French Polynesia to prepare for the South Pacific season. South Pacific fishing areas extend from the east coast of New Zealand to approximately 110°W between 25°S and 45°S. At the end of the season (in March or April), most vessels unload in Pago Pago, American Samoa then travel to Hawaii or the U.S. West Coast to prepare for the next North Pacific fishing season.

DATA COLLECTED

The SWFSC collects landings, logbook and length-frequency information from the two U.S. Pacific albacore troll fisheries and sea surface temperature information for the North Pacific fishery. Landings data are provided by the WFOA and collected from state landings receipts that are submitted by fish buyers and canneries. Daily catch and effort data are obtained from completed copies of the *U.S. Pacific Albacore Logbook*, that are voluntarily submitted by fishermen, or completed by port samplers who collect the information from cooperating fishermen. Approximately 650 logbooks were distributed to albacore fishermen for the 1996 North Pacific and the 1995-96 South Pacific albacore seasons. Length-frequency data from the 1996 North Pacific season were collected by one NMFS biologist aboard a U.S. troll vessel and by port samplers in the ports of Westport, Ilwaco, Astoria, Newport, Coos Bay, Crescent City, Eureka, Monterey, Terminal Island, and Pago Pago. Length-weight-age conversions for North Pacific albacore and length-weight conversions for South Pacific albacore were taken from "A review of the biology and fisheries for North Pacific albacore (*Thunnus alalunga*)" by Bartoo and Foreman, 1993.

North Pacific sea surface temperatures (SSTs) recorded from commercial transport ships, fishing vessels, and research vessels, were compiled into monthly means and computer-analyzed. Contours of SSTs were drawn with a resolution of 1° latitude-longitude (Figures 9a through 9g). Analysis of the SSTs show the distribution of isotherms and the locations of ocean fronts (areas of north-south close spacing of isotherms). Not enough SST information exists from the areas of the South Pacific fishery (east of New Zealand to 110°W and south of 30°S) to make an analysis possible.

This report summarizes the catch, effort, landings and length-frequency information collected from the 1996 North Pacific and the 1995-96 South Pacific albacore seasons. Data from the 1995 North Pacific season, 1994-95 South Pacific season, and from foreign albacore fisheries (where available) are included for comparison.

LOGBOOK SAMPLING COVERAGE

Logbook sampling coverage is the ratio of landings from sampled trips (those trips from which logbook data were received) to total landings. Landings from sampled trips in some past seasons are not available. For consistent comparison of sampling coverage between current and past seasons, sampled landings are estimated by multiplying numbers of fish caught (recorded in logbooks) by the average weight of those fish and summing these estimates from sampled logbooks.

More than 400 trips (of 1,200 total trips) were sampled for logbook information during the 1996 North Pacific season. Sampled landings total 6,687 metric tons (t), resulting in a logbook sampling coverage rate of 43%, compared to 61% for 1995 (Table 3).

Logbook data from the 1995-96 South Pacific season were collected from 29 trips of the 44 trips completed. These sampled trips landed 1,049 t, resulting in a logbook sampling coverage of 48% compared to 56% for the 1994-95 season (Table 4).

LENGTH-FREQUENCY SAMPLING COVERAGE

Length-frequency sampling coverage is the ratio of the number of fish sampled (measured) to the total number of fish landed for the season. The total number of fish landed for the season is estimated by dividing total landings by the average weight of fish landed. A total of 14,285 albacore were measured by one NMFS biologist and 10,890 albacore were measured by port samplers during the 1996 North Pacific season compared to 24,350 fish measured in 1995. Length-frequency sampling coverage for the 1996 North Pacific season is 0.9% compared to 2.0% coverage in 1995 (Table 3).

Length-frequency data for the 1995-96 South Pacific albacore fishery were collected by port samplers in Pago Pago. Samplers measured 2,226 albacore from troll vessel landings and transshipments, resulting in a length-frequency sampling coverage rate of 0.7%. The length-frequency coverage for the 1994-95 season is 0.5% (Table 4).

TOTAL CATCH AND EFFORT

Total fishing effort for the U.S. albacore troll fisheries is estimated by dividing total landings (in pounds) by catch-per-unit effort (in numbers of fish per day) then dividing by average weight (in pounds). Troll vessels fished 30,439 days during the 1996 North Pacific albacore season, an 18% increase in effort from 25,825 days fished in 1995 (Table 3). Total landings from the 1996 North Pacific albacore season are 15,600 t compared to 8,200 t landed in 1995. Estimated albacore landings by foreign fisheries that target albacore in the North Pacific are listed in Table 1.

Troll vessels fished 4,551 days during the 1995-96 South Pacific albacore fishery, an increase of 131% over 1,970 days fished in the 1994-95 season (Table 4). Total U.S. landings for 1995-96 increased slightly to 2,186 t from 2,072 t landed in 1994-95. Estimates of landings by foreign fisheries targeting albacore in the South Pacific are listed in Table 2.

LOCATION OF CATCHES

Albacore catches recorded during the 1996 North Pacific season extend from the West Coast to 157°E, between 30°N and 50°N. Areas of high catch indicate productive regions where albacore are available to troll gear. Catches were summarized for the season and each month by 1°x 1° squares (Figures 1a through 1h). Based on sampled logbook data, the highest catch areas for the season were located between 148°W and 154°W from 40°N to 45°N, and between 125°W and 128°W from 41°N to 46°N (Figure 1a). Early season catches were greatest in June between 160°E and 175°E from 34°N to38°N and between 138°W and 143°W from35°N to 40°N (Figure 1c). By July excellent catches were recorded between 147°W and 155°W from 39°N to 43°N (Figure 1d). This area remained highly productive through September. Fishing along the U.S. West coast was most productive in August and September between 125°W and 128°W from 41°N to 46°N (Figures 1e and 1f). Catches were less widely dispersed in October but remained high between 151°W and 159°W from 39°N to 42°N and between 125°W and 127°W from 40°N to 45°N (Figure 1g).

Catches recorded during the 1995-96 South Pacific season were summarized for the season and for each month by 5°x5° squares (Figures 2a through 2e). The areas of highest catch for the season were distributed between 150°W and 165°W from 35°S to 45°S (Figure 2a). Fishing became productive in January 1996 when catches between 155°W and 165°W from 35°S to 40°S exceeded 14,000 fish (Figure 2c). Catches recorded in February were further east and were highest between 150°W and 155°W from 35°S to 45°S (Figure 2d). Catches in March were more widely scattered as the season came to an end.

SEA SURFACE TEMPERATURES AND SAMPLED CATCHES

Catch areas recorded by the North Pacific albacore fleet during each month of the season are shaded on the corresponding monthly SST charts (Figures 3a through 3g) to show the relationship between areas of fishing activity, ocean fronts and isotherm patterns. Most North Pacific albacore fishing activity in May was located northeast of Midway Island and south of 35°N between the International Dateline and 150°W (Figure 3a). In these areas, lower than normal SSTs ranged from 17°C to 19°C (62.6°F to 66.2°F). Catch areas shifted north of 35°N in June, and expanded markedly between 160°E and 130°W (Figure 3b). Most fishing activity was distributed along the sub-arctic ocean front where SSTs were 2°C below normal and ranged from 14°C to 18°C (57.2°F to 64.4°F). The albacore fleet continued to move northeastward in July, paralleling the northward shift of the sub-arctic front delineated by the 15°C and 18°C isotherms (Figure 3c). Coastal fishing in July from Washington State to Point Conception had limited success in coastal, upwelling water which was near the normal range of 14°C to 16°C (57.2°F to 59.8°F). Fishing activity in August was concentrated off the coasts of Washington and Oregon, east of 155°W, between 42°N and 45°N (Figure 3d). Here, SSTs were near normal in the range of 15°C to 18°C (59.0°F to 64.4°F). Coastal fishing intensified in August from the Columbia River to Cape Blanco, just west of the region of closely-packed, north-south isotherms caused by coastal upwelling. SSTs were about 1°C below normal here ranging from 14°C to 18°C (57.2°F to 59.8°F). The seasonal, coastal upwelling of nutrient-rich subsurface water became well established from northern Oregon to Monterey Bay in August. Coastal upwelling continued to be strong from 38°N to 45°N in September (Figure 3e). Productive coastal fishing was concentrated along the western boundary of the most intense upwelling, where SSTs continued to be 1°C below normal in the range of 14°C to 18°C (57.2°F to 64.4°F). Fishing activity offshore (between 155°W and 140°W, from 42°N to 46°N) remained intense during September. Here, as in August, SSTs were in the normal range of 15°C to 18°C (59.0°F to 64.4°F). During October the offshore group moved westward along 40°N, between 145°W and 160°W, where a weak subarctic front persisted (Figure 3f). Part of the albacore fleet continued to fish along the West Coast in October, ranging from Washington State to Central California. Coastal upwelling remained strong in this region, and most fishing occurred in 14°C to 16°C (57.2°F to 60.8°F) water that was 1°C below normal. By November fishing activity shifted west, centered around 40°N, between 135°W and 155°W (Figure 3g). SSTs in these areas were slightly above normal, in the range of 15°C to 17°C (59.0°F to 62.6°F).

CATCH-PER-UNIT EFFORT

Catch-Per-Unit Effort (CPUE) is used as an indication of relative abundance of albacore available to troll gear, or a measure of fishing success, and is expressed in numbers of fish caught

per day of fishing. Catch (in numbers of fish) and effort (in days fished) were summarized by 10-day, 1°-square strata in which there was at least one day of fishing effort (Kleiber and Perrin, 1991). Average CPUE is calculated as follows:

$$Average\ CPUE = \frac{1}{n} \sum \left(\frac{\sum C_i}{\sum E_i} \right)$$

Where C_i is the total sampled catch in the i^{th} strata, E_i is the total sampled effort in the i^{th} strata, and n is the total number of strata.

The average CPUE for the 1996 North Pacific season was 91 fish per day. This is a 94% increase over 47 fish per day for the 1995 season (Table 3). The CPUE for the 1995-96 South Pacific season was 71 fish per day, a large decrease from 150 fish per day in the 1994-95 season[1] (Table 4).

CPUEs from the 1996 North Pacific season were summarized (averaged) for the season and each month by 1°x1° squares (Figures 4a through 4h). The season's highest CPUEs were between 150°W and 161°W from 38°N to 46°N (Figure 4a). CPUEs in the early part of the season were highest between 160°E and 171°E from 34°N to 38°N. CPUEs greater than 300 fish per day in July and August were concentrated between 149°W and 161°W, from 39°N to 45°N (Figures 4d and 4e). CPUEs in areas further west in July were highly variable and scattered between 171°W and 170°E, from 37°N to 40°N. CPUEs in areas near the coast were highest in September between 125°W and 128°W, from 41°N to 45°N (Figure 4f). Fishing remained successful in October and November, despite fewer vessels fishing.

CPUEs for the 1995-96 South Pacific season were summarized (averaged) for the season and each month by 5° x 5° squares(Figures 5a through 5e). Season-averaged CPUEs exceeded 100 fish per day in only two 5° squares: one between 150°W and 155°W, from 30°S to 35°S and one between 140°W and 145°W, from 40°S to 45°S (Figure 5a). Early season CPUEs were low, exceeding 100 fish per day in only one 5° square in December between 160°W and 165°W, from 35°S to 40°S (Figure 5b). CPUEs between 100 and 300 fish per day in March were distributed between 140°W and 165°W, from 30°S to 35°S and from 40°S to 45°S (Figure 5e).

LENGTH-FREQUENCIES

Fork lengths of albacore measured during the 1996 North Pacific season range from 43 cm (4 lb or 1.6 kg) to 115 cm (68 lb or 31.0 kg) and average 65 cm (12 lb or 5.6 kg). The average fork length of sampled albacore from the 1995 season was 69 cm (15 lb or 6.7 kg.). Two length-frequency modes are evident in the histogram of samples from the 1996 North Pacific season (Figure 6). The most prominent mode is centered at 64 cm fork length, while a much smaller mode is centered at 76 cm. These modes correspond to approximately 3, and 4 year-old fish, respectively.

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[1] CPUE values for past seasons may differ from previously published values due to updates in catch/effort data.

Fork lengths of albacore sampled during the 1995-96 South Pacific season range from 48 cm (5 lb or 2.3 kg) to 105 cm (52 lb or 23.6 kg) and average 69 cm (15 lb or 6.7 kg). The average fork length of sampled albacore from the 1994-95 season was 70 cm (16 lb or 7.0 kg.). Two distinct length-frequency modes are apparent in the histogram of samples from the 1995-96 season, one centered at 62 cm and another centered at 70 cm (Figure 7). These modes correspond, approximately, to 3 and 4 year-old fish, respectively (Labelle, et. al., 1993).

GEOGRAPHIC DISTRIBUTION OF LENGTH-FREQUENCIES

Length-frequencies from the 1996 North Pacific season were summarized by 5°x10° quadrangles to compare sizes of fish caught in different areas (Figure 8). Two length-frequency modes are discernable in samples obtained from areas west of 150°W. The most prominent mode is centered at 63 cm and a smaller mode is centered at 76 cm. The sample from 35°N, 140°W exhibits an additional mode centered at 53cm. Large fish are more prominent in the inshore sample from 35°N, 120°W.

Length-frequency samples from the 1995-96 South Pacific fishery were also summarized by 5°x10° quadrangles. Only one summarized quadrangle contained more than 50 sampled fish. Two length-frequency modes centered at 61 cm and 71 cm are visible in this sample (Figure 9).

SUMMARY

Logbook and length-frequency sampling coverages for the 1996 North Pacific albacore fishery decreased to 43% and 0.9%, respectively, compared with the 1995 season. U.S. troll vessels expended more than 30,000 days of effort and landed a total of 15,600 t during the 1996 North Pacific season. The 1996 North Pacific albacore season began in May northeast of Midway Island and ended in November off the U.S. West Coast. Troll vessel catch locations ranged from 125°W to areas west of the International Dateline. The highest sampled catches during the season were centered near 42°N, 151°W, and near 43°N, 126°W. Areas of high catch and intense fishing activity were located along the subarctic ocean front delineated by 15°C and 18°C isotherms (59.0°F and 64.4°F, respectively). The average CPUE for the 1996 season increased to 91 fish per day from 47 fish per day during the 1995 season. The highest season-averaged CPUEs were distributed between 150°W and 161°W, from 38°N to 46°W. More than 25,000 albacore were measured during the North Pacific season. Fork lengths of sampled albacore range from 43 cm (4 lb or 1.6 kg) to 115 cm (68 lb or 31.0 kg) and the average fork length is 65 cm (12 lb or 5.6 kg). The histogram of length-frequency samples from the 1996 season displays a well-defined mode centered at 64 cm fork length and a weaker mode centered at 76 cm. Two length-frequency modes are evident in samples from outside 140°W and in the southeastern-most sample.

The 1995-96 South Pacific U.S. troll fishery caught approximately 6% of the albacore landed by all South Pacific albacore fisheries. Logbook sampling coverage decreased from 56% in the 1994-95 season to 48% in the 1995-96 season. Length-frequency sampling coverage increased from 0.5% in the 1994-95 season to 0.7% in the 1995-96 season. U.S. troll vessels expended 4,551 days of effort and landed 2,186 t of albacore. The 1995-96 season began in December 1995 and ended in March 1996. Catches were highest between 150°W and 165°W, from 35°S to 45°S. The average

CPUE for the 1995-96 season decreased from 150 fish per day in the 1994-95 season to 71 fish per day. The highest CPUEs were distributed between 150°W and 155°W, from 30°S to 35°S and between 140°W and 145°W, from 40°S to 45°S. A total of 2,226 albacore were measured during the season. Fork lengths of measured fish range from 48 cm (5 lb or 2.3 kg) to 105 cm (52lb or 23.6 kg) fork length, and average 69 cm (15 lb or 6.7 kg). Two length-frequency modes (centered at 62 cm and 70 cm) are evident in the histogram of samples. Only one 5° x10° summarized quadrangle had more than 50 sampled fish and displays two modes centered at 61 cm and 71 cm.

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Table 1. North Pacific albacore landings (in metric tons) by fisheries, 1952-1996.[1] Provisional estimates are given in parentheses. -- indicates data not available. (0) indicates less than 1 metric ton.

	JAPAN[2]					TAIWAN[3]		KOREA[4]		U.S.[5]							CANADA[6]	MEXICO	
YEAR	GILL NET	LONG LINE	POLE & LINE	PURSE SEINE	OTHER GEAR	GILL NET	LONG LINE	GILL NET	LONG LINE	BAIT BOAT	GILL NET	LONG LINE	PURSE SEINE	SPORT	TROLL	OTHER GEAR	TROLL	OTHER GEAR	GRAND TOTAL
1952		26,687	41,786	154	237									1,373	23,843		71		96,103
1953		27,777	32,921	38	132									171	15,740		5		78,737
1954		20,958	28,069	23	38									147	12,246				63,435
1955		16,277	24,236	8	136									577	13,264				56,453
1956		14,341	42,810		57									482	18,751		17		78,414
1957		21,053	49,500	83	151									304	21,165		8		94,221
1958		18,432	22,175	8	124									48	14,855		74		57,674
1959		15,802	14,252		67									0	20,990	5	212		53,287
1960		17,369	25,156		76									557	20,100	4	5		65,227
1961		17,437	18,636	7	268					2,837				1,355	12,055	6	4		54,566
1962		15,764	8,729	53	191					1,085				1,681	19,752	8	1		49,226
1963		13,464	26,420	59	218					2,432				1,161	25,140	7	5		70,869
1964		15,458	23,858	128	319		26			3,411				824	18,388	4	3		64,383
1965		13,701	41,491	11	121		261			417				731	16,542	3	15		75,258
1966		25,050	22,830	111	585		271			1,600				588	15,333	9	44		68,387
1967		28,869	30,481	89	520		635			4,113				707	17,814	12	161		85,368
1968		23,961	16,597	267	1,109		698			4,906				951	20,434	10	1,028		71,929
1969		18,006	32,107	521	1,480		634			2,996				358	18,827	12	1,365		78,275
1970		15,372	24,376	317	794		1,516			4,416				822	21,032	9	354		70,978
1971		11,035	53,198	902	367		1,759			2,071				1,175	20,526	11	1,587		94,602
1972	1	12,649	60,762	277	646		3,091			3,750				637	23,600	8	3,558	100	111,051
1973	39	16,059	69,811	1,353	533		128			2,236				84	15,653	14	1,270	0	109,153
1974	224	13,053	73,576	161	959		570			4,777				94	20,178	9	1,207	1	116,783
1975	166	10,060	52,157	159	254		1,494		2,463	3,243				640	18,932	43	101	1	91,688
1976	1,070	15,896	85,336	1,109	285		1,251		859	2,700				713	15,905	27	252	36	127,415
1977	688	15,737	31,934	669	379		873		792	1,497				537	9,969	36	53	0	65,141
1978	4,029	13,061	59,877	1,115	2,097		284		228	950				810	16,613	69	23	1	101,135
1979	2,856	14,249	44,662	125	1,158		187	0	259	303				74	6,781	31	521	1	73,186

Table 1. (continued)

YEAR	JAPAN[2]					TAIWAN[3]		KOREA[4]		U.S.[5]							CANADA[6]	MEXICO	GRAND TOTAL
	GILL NET	LONG LINE	POLE & LINE	PURSE SEINE	OTHER GEAR	GILL NET	LONG LINE	GILL NET	LONG LINE	BAIT BOAT	GILL NET	LONG LINE	PURSE SEINE	SPORT	TROLL	OTHER GEAR	TROLL	OTHER GEAR	
1980	2,986	14,743	46,743	329	1,209	--	318	(6)	597	382				168	7,556	24	212	31	(75,304)
1981	10,348	18,020	27,426	252	904	--	339	(16)	459	748				195	12,637	60	200	8	(71,612)
1982	12,511	16,762	29,615	561	732	--	559	(113)	387	425				257	6,609	84	104	7	(68,726)
1983	6,852	15,103	21,098	350	125	--	520	(233)	454	607				87	9,359	213	225	33	(55,259)
1984	8,988	15,111	26,015	3,380	518	--	471	(516)	136	1,030			3,728	1,427	9,304	138	50	113	(70,925)
1985	11,204	14,320	20,714	1,533	407	--	109	(576)	291	1,498	2			1,176	6,415	83	56	49	(58,433)
1986	7,813	12,945	16,096	1,542	650	--	--	(726)	241	432	3			196	4,708	106	30	3	(45,491)
1987	6,698	14,642	19,091	1,205	189	2,514	--	(817)	182	158	5			74	2,766	136	104	7	(48,588)
1988	9,074	13,904	6,216	1,208	177	7,389	38	(1,016)	109	598	15			64	4,212	318	155	15	(44,508)
1989	7,437	13,194	8,629	2,521	466	8,350	544	(1,023)	81	54	4			160	1,860	272	200	2	(44,797)
1990	6,064	15,928	8,532	1,995	253	16,701	287	(1,016)	20	115	29		71	24	2,603	181	302	2	(54,123)
1991	3,401	10,379	7,103	2,652	399	3,398	353	(852)	3	0	17		0	6	1,845	384	139	--	(30,931)
1992	2,721	19,149	13,888	4,104	1,534	7,866	300	(271)	43	0	0	363	0	2	4,572	408	363	--	(55,584)
1993	287	19,730	23,700	2,889	896	0	300	0	43	--	0	454	--	25	6,254	331	329	--	(55,238)
1994	263	10,200	26,391	2,026	834	0	300	0	43	0	38	565	--	106	10,978	712	68	--	(52,524)
1995	263	10,200	23,700	2,026	834	0	300	0	43	0	40	878	--	102	8,200	1,096	68	--	(47,750)
1996	(263)	(10,200)	(23,700)	(2,026)	(834)	(0)	(300)	(0)	(43)	(0)	(54)	(1,144)	--	(88)	15,600	(545)	(1,800)	--	(56,597)

1 Data are from the 13th North Pacific Albacore Workshop, December 8-15 1993, La Jolla, California, except as noted.

2 Japanese pole & line landings include fish caught by research vessels. Longline landings for 1952-1960 exclude minor amounts taken by vessels under 20 metric tons.

3 Data from Liu and Hsu (1996).

4 Korean longline landings calculated from Y. Gong (pers. comm.) using the ratio of landings, in numbers, from the North Pacific. Gillnet landings for 1979-1990 are calulated by multiplying the 1991 CPUE (# fish per pok) by effort (# poks) then multiplying by average weight (1991, 1992: 4.13 kg/fish).

5 U.S. troll boat landings for 1952-1960 include fish caught by bait boats. U.S. troll boat landings for 1984-1988 include gillnet landings. Other gear include landings from Hawaii (mostly longline). Other gear landings for 1979-1986 are raised from data with very low coverage rates.

6 Data from Shaw (1996).

Table 2. South Pacific albacore landings (in metric tons) by fisheries, 1952-1996.[1] Provisional estimates are given in parentheses. -- indicates data not available. (0) indicates less than 1 metric ton.

YEAR	JAPAN[2]			TAIWAN		KOREA		U.S.[3]		NEW ZEALAND		FRENCH POLYNESIA		FIJI	AUSTRALIA[4]		NEW CALEDONIA	TONGA	SOLOMON[5] ISLANDS	OTHER		GRAND TOTAL
	GILL NET	LONG LINE	POLE & LINE	GILL NET	LONG LINE	GILL NET	LONG LINE	LONG LINE	TROLL	LONG LINE	TROLL	LONG LINE	TROLL	LONG LINE	LONG LINE	TROLL	LONG LINE	LONG LINE	LONG LINE	LONG[6] LINE	TROLL[7]	
1952		154																				154
1953		803																				803
1954		9,578																				9,578
1955		8,625																				8,625
1956		7,281																				7,281
1957		8,757																				8,757
1958		18,490					146															18,636
1959		17,385					456															17,841
1960		21,638	45				610															22,293
1961		23,412					330															23,742
1962		34,620					599															35,219
1963		29,120	16				1,367															30,503
1964		19,390					2,911															22,301
1965		17,793					6,405															24,198
1966		21,627					10,817															32,444
1967		15,104			11,723		13,717				5											40,549
1968		6,659			12,375		10,138				14											29,186
1969		4,894			9,557		9,963				--											24,414
1970		5,297			14,682		11,599				50		0			100						31,728
1971		3,472			15,880		14,482				--		0			100						33,934
1972		3,027			16,780		14,439				268		0			100						34,614
1973		2,550			17,742		17,452				484		0			100			4			38,332
1974		1,868			17,246		12,194				898		0			100			0			32,306
1975		1,333			16,939		9,015				646		0			100			0			28,033
1976		2,054			13,653		12,212				25		0			100			6			28,050
1977		2,328			21,452		13,176				621		0			100			9			37,686
1978		2,845			20,935		10,989				1,686		0			100			9			36,564
1979		2,274			14,952		8,682				814		0			100			21			26,843

Table 2. (continued)

YEAR	JAPAN[2]			TAIWAN		KOREA		U.S.[3]		NEW ZEALAND		FRENCH POLYNESIA		FIJI	AUSTRALIA[4]		NEW CALEDONIA	TONGA	SOLOMON ISLANDS[5]	OTHER		GRAND TOTAL
	GILL NET	LONG LINE	POLE & LINE	GILL NET	LONG LINE	GILL NET	LONG LINE	LONG LINE	TROLL	LONG LINE	TROLL	LONG LINE	TROLL	LONG LINE	LONG LINE	TROLL	LONG LINE	LONG LINE	LONG LINE	LONG[6] LINE	TROLL[7]	
1980		2,216	19		25,579		10,852				1,468	0				100			25			40,259
1981		4,203	8		14,367		14,793				2,085	0				5			2			35,463
1982		4,899	1		12,644		12,586				2,434	0				6		106	8			32,684
1983	32	5,723	2		12,106		6,669				744	0				7	12	143	19			25,457
1984	1,581	3,804			11,155		5,730				2,773	0				8	112	135	19			25,317
1985	1,928	3,868			9,601		14,267				3,253	0				9	131	174	12			33,243
1986	1,936	4,426			11,913		18,799		89		1,911	0			40	10	179	206				39,509
1987	919	4,490			15,009		8,646		751		1,227	0			131	11	563	252				31,999
1988	4,271	7,469		1,000	17,120		5,600		3,253		330	0			107	12	584	242			140	40,128
1989	13,263	5,839		8,520	10,867	172	3,997		3,068	19	5,161	100	90	5	93	13	566	195			162	52,130
1990	5,667	6,574		1,859	9,689		2,586		3,898	249	2,525	156	327	263	125	15	1,053	152			--	35,138
1991		4,468		821	11,235		1,225		5,540	325	2,464	146	326	416	170	20	909	174			103	28,342
1992		3,914	49		18,989		1,556		3,016	706	3,856	174	72	310	207	70	520	199			0	33,638
1993		8,384	5		12,986		2,600		1,028	245	3,856	714	45	463	185	55	755	232		1	0	31,554
1994		7,396			22,000		1,283	78	530	539	4,400	913	0	562	363	70	840	599		26	--	39,599
1995		8,227	--		17,000		1,283	54	2,072	539	6,000	770	184	659	434	25	332	599		288	0	38,466
1996		(8,227)			(17,000)		(1,283)	(118)	(2,186)	(539)	(6,000)	(770)	(184)	(659)	(434)	(25)	(332)	(599)			(0)	(38,356)

1 1952-1993 data are from South Pacific Albacore Research Workshop March 5-7 1996, Rarotonga, Cook Islands; 1993-1995 data are from Lawson (1996) except as noted.

2 Japanese longline landings include landings from Australian-Japanese joint venture landings.

3 United States landings are listed for seasons which may include landings from December of previous year.

4 Australian longline landings include only domestic landings, not joint venture landings.

5 All Solomon Islands landings from Lawson (1996).

6 Other longline landings include Peoples Republic of China, Papau New Guinea, Cook Islands, American Samoa, and Western Samoa.

7 Other troll landings include Canada and Fiji.

Table 3. Fishery statistics for the 1995 and 1996 U.S. North Pacific albacore troll fisheries.*

FISHING SEASON	NO. OF VESSEL TRIPS		METRIC TONS LANDED		NO. FISH LANDED		AVG FORK LENGTH (cm)	AVG WT (lb)	TOTAL DAYS OF EFFORT	CPUE (fish/day)	SAMPLING COVERAGE	
	TOTAL	SAMPLED	TOTAL	SAMPLED	TOTAL	SAMPLED (MEASURED)					LOGBOOK	LENGTH-FREQUENCY
1995	907	362	8,200	5,027	1,217,889	24,350	69	14.8	25,825	47	61%	2.0%
1996	1,200	416	15,600	6,687	2,769,914	25,175	65	12.4	30,439	91	43%	0.9%

* Includes some foreign-registered vessels (Tonga, Canada, and Cook Islands) and vessels of unknown registry for logbook sampling cover

Table 4. Fishery statistics for the 1994-95 and 1995-96 U.S. South Pacific albacore troll fisheries.*

FISHING SEASON	NO. OF VESSEL TRIPS		METRIC TONS LANDED		NO. FISH LANDED		AVG FORK LENGTH (cm)	AVG WT (lb)	TOTAL DAYS OF EFFORT	CPUE (fish/day)	SAMPLING COVERAGE	
	TOTAL	SAMPLED	TOTAL	SAMPLED	TOTAL	SAMPLED (MEASURED)					LOGBOOK	LENGTH-FREQUENCY
1994-95	47	22	2,072	1,153	294,781	1,460	70	15.5	1,970	150	56%	0.5%
1995-96	44	29	2,186	1,049	324,671	2,226	69	14.8	4,551	71	48%	0.7%

* Includes some vessels of unknown registry for logbook sampling coverage rate.

Figures

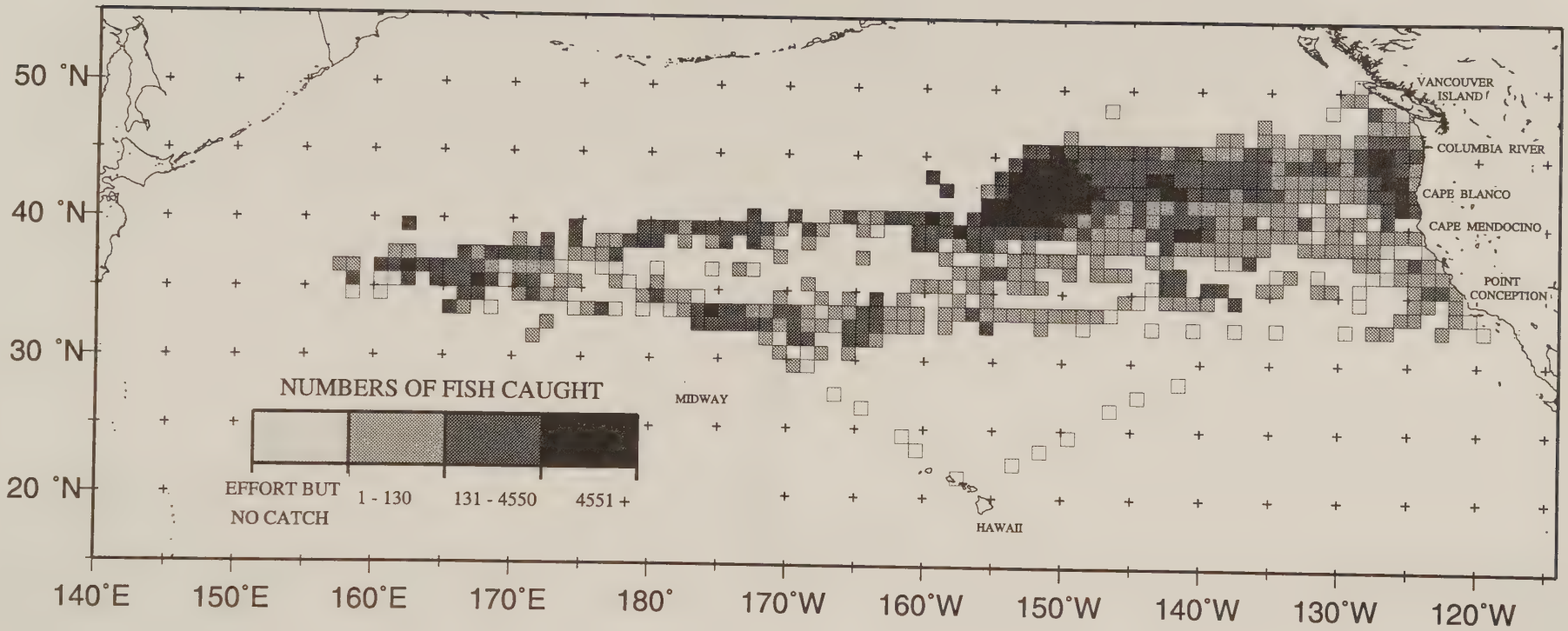

Figure 1a. Catches of albacore in the North Pacific for the 1996 season.

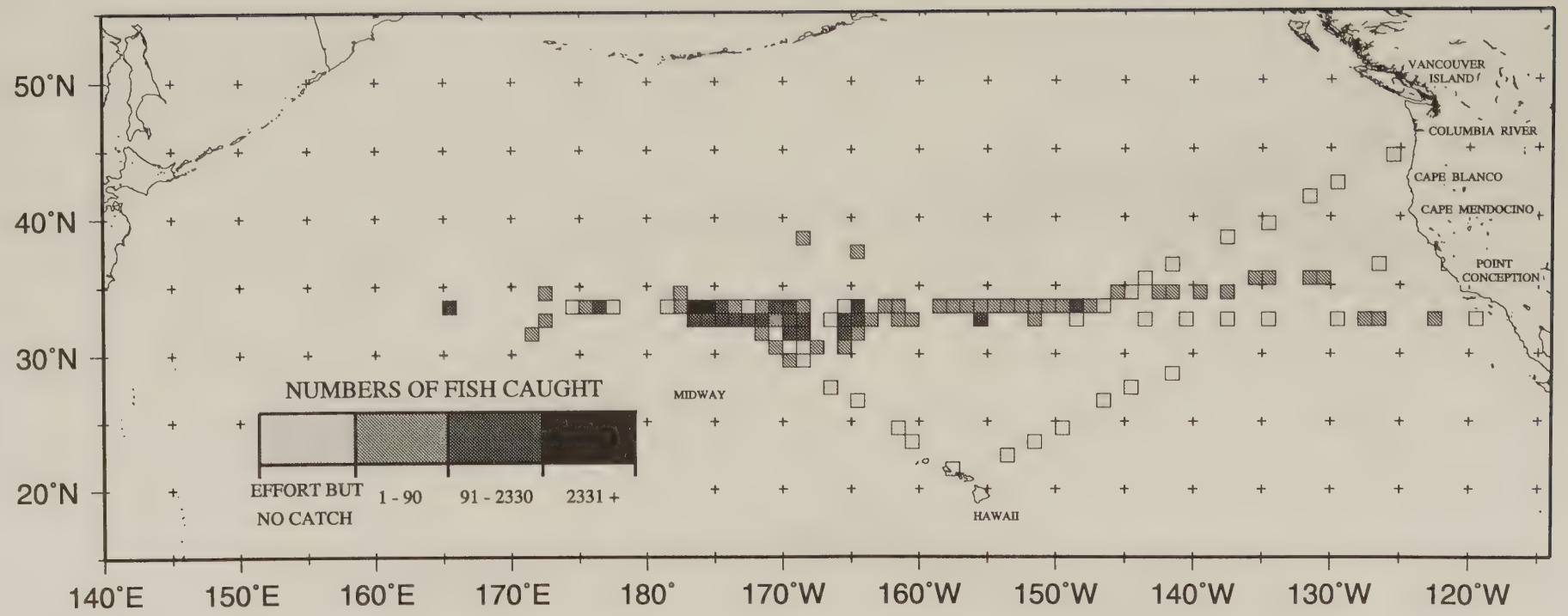

Figure 1b. Catches of albacore in the North Pacific for May 1996.

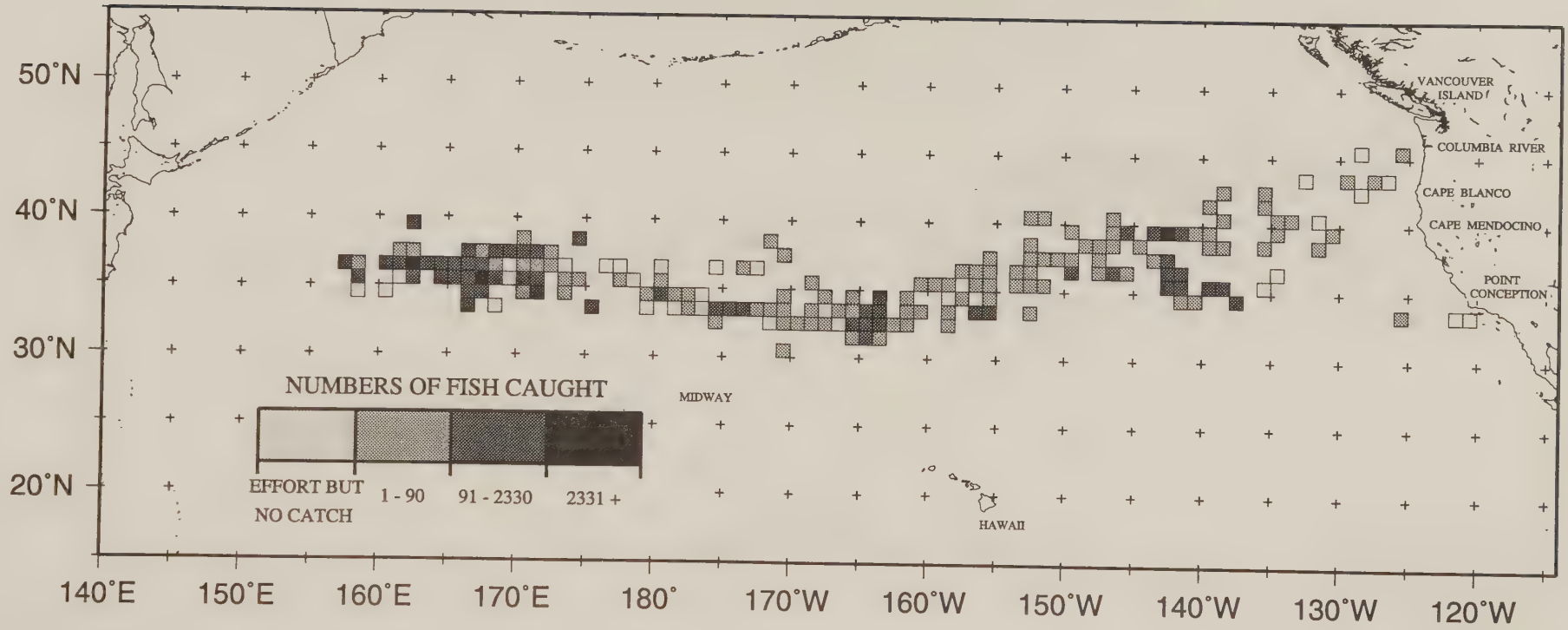

Figure 1c. Catches of albacore in the North Pacific for June 1996.

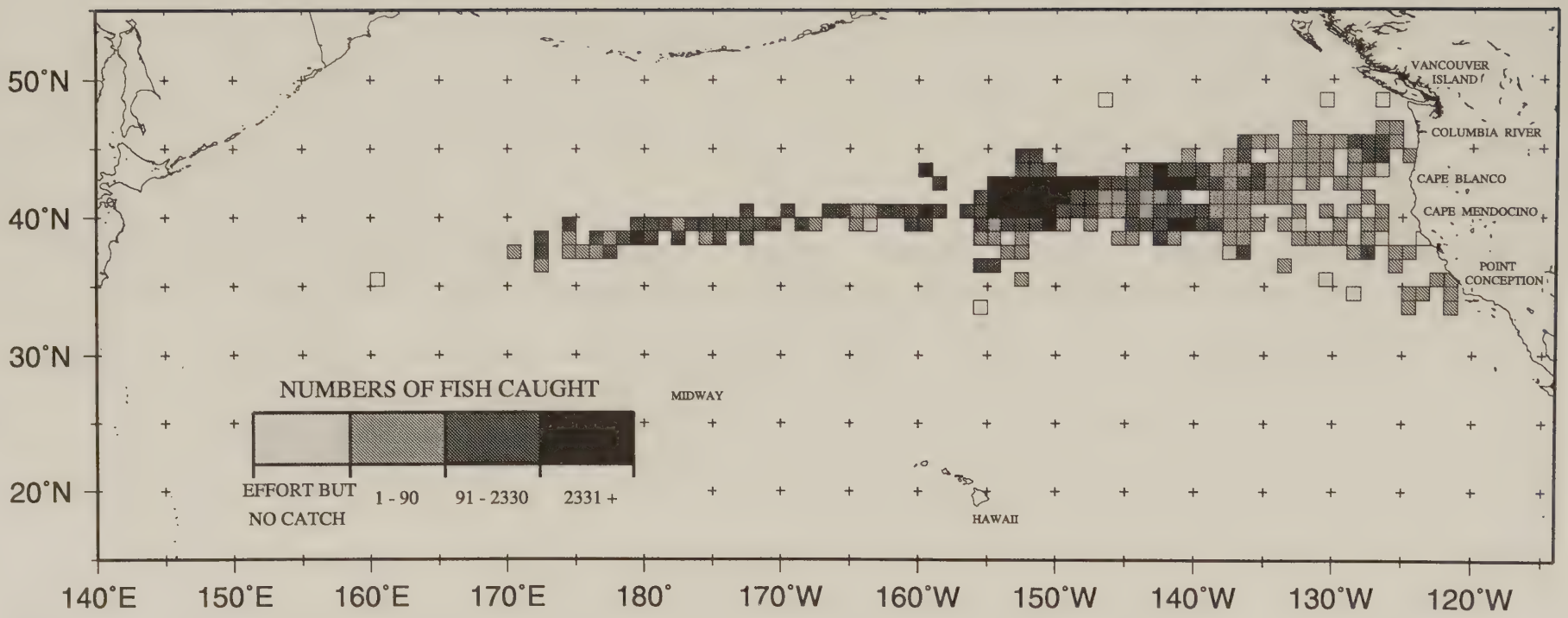

Figure 1d. Catches of albacore in the North Pacific for July 1996.

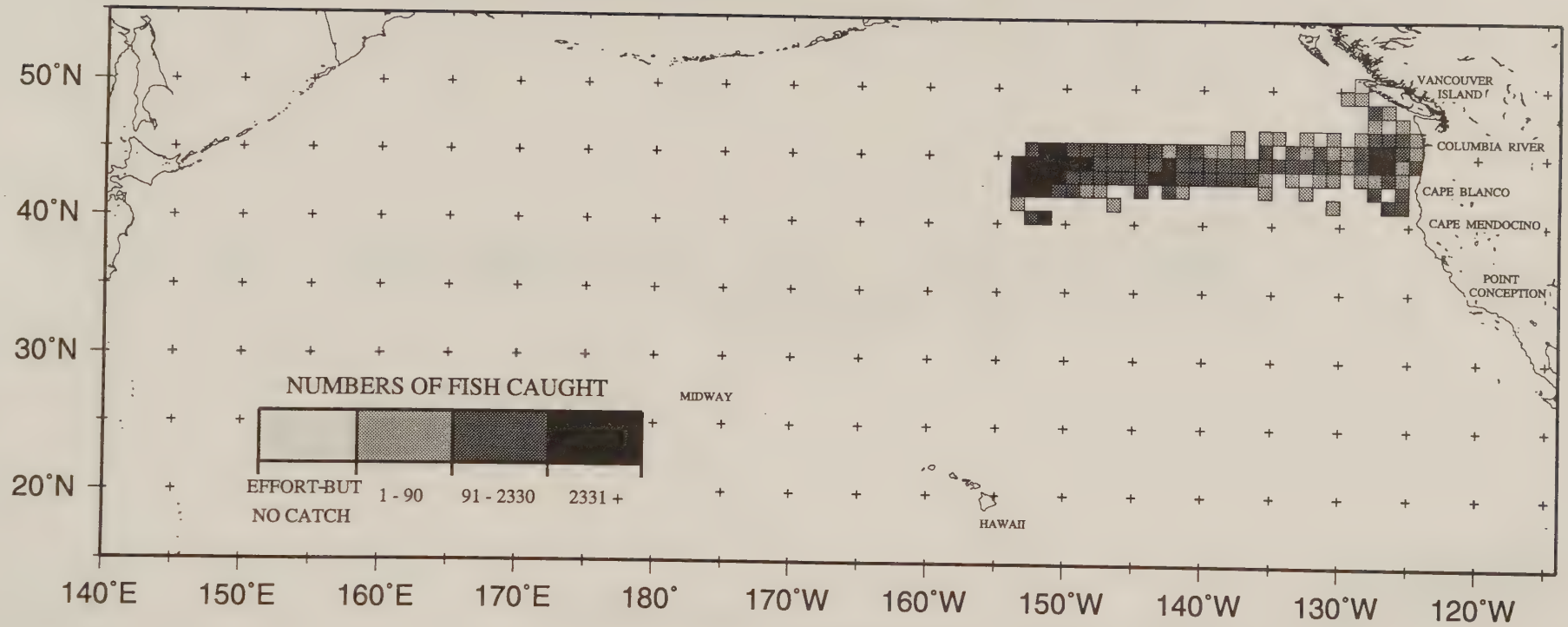

Figure 1e. Catches of albacore in the North Pacific for August 1996.

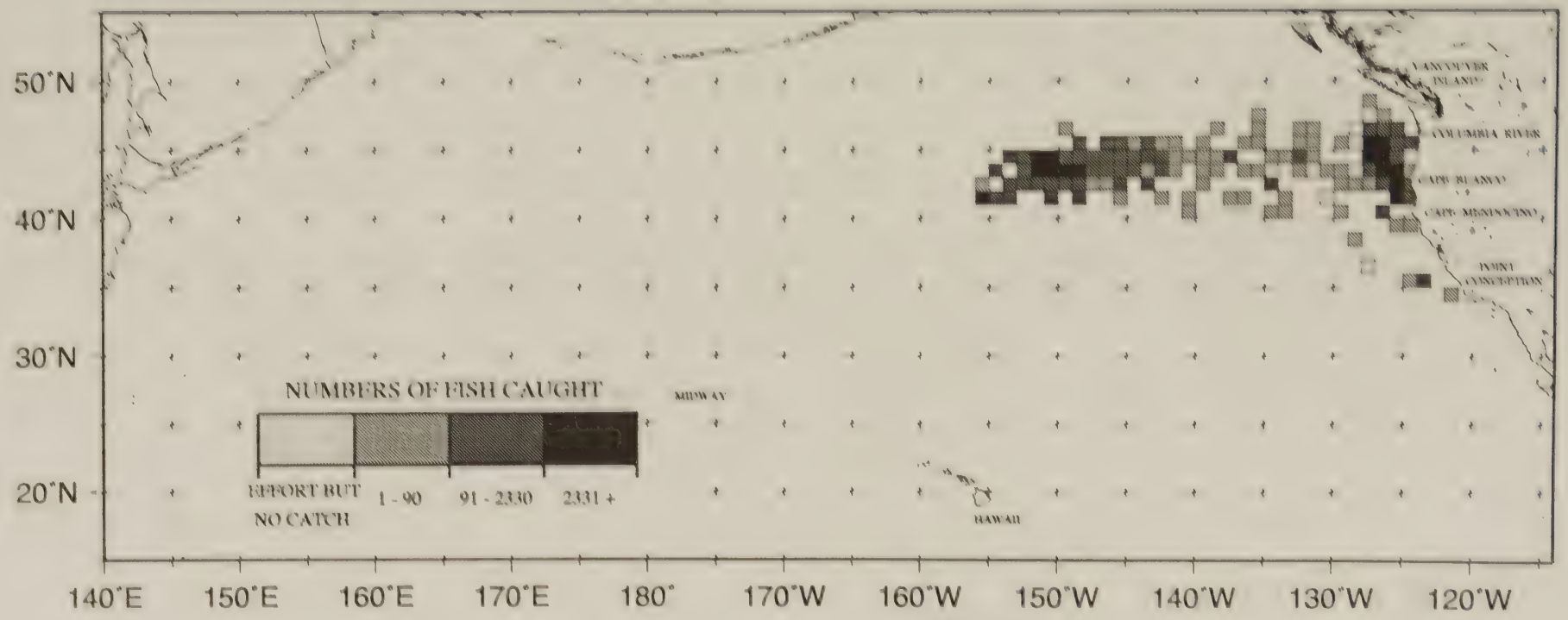

Figure 1f. Catches of albacore in the North Pacific for September 1996.

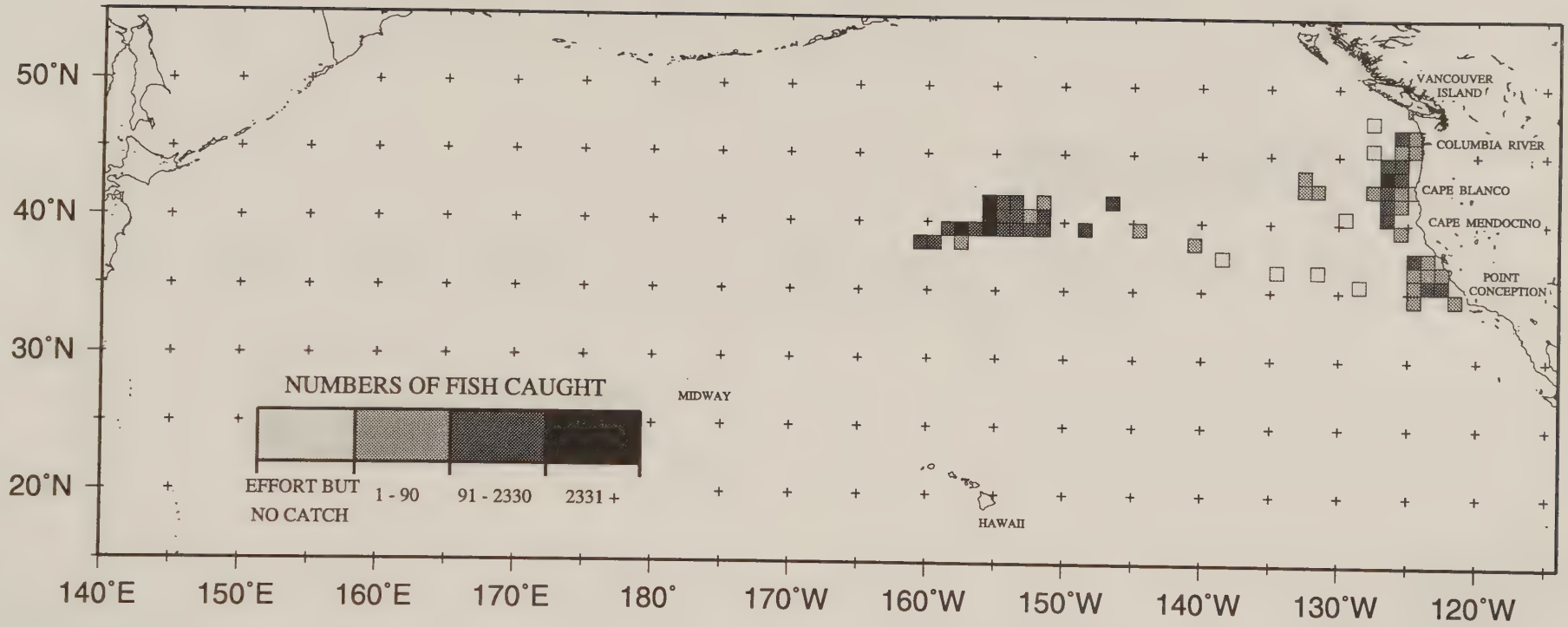

Figure 1g. Catches of albacore in the North Pacific for October 1996.

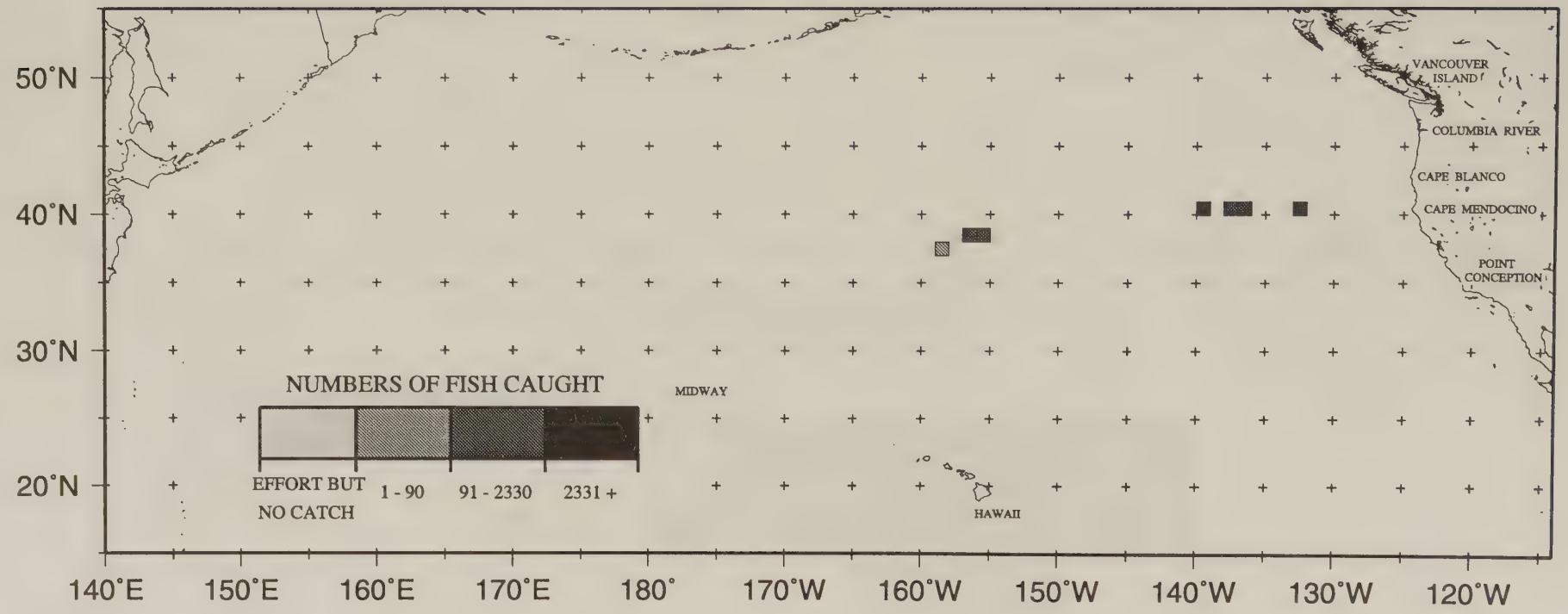

Figure 1h. Catches of albacore in the North Pacific for November 1996.

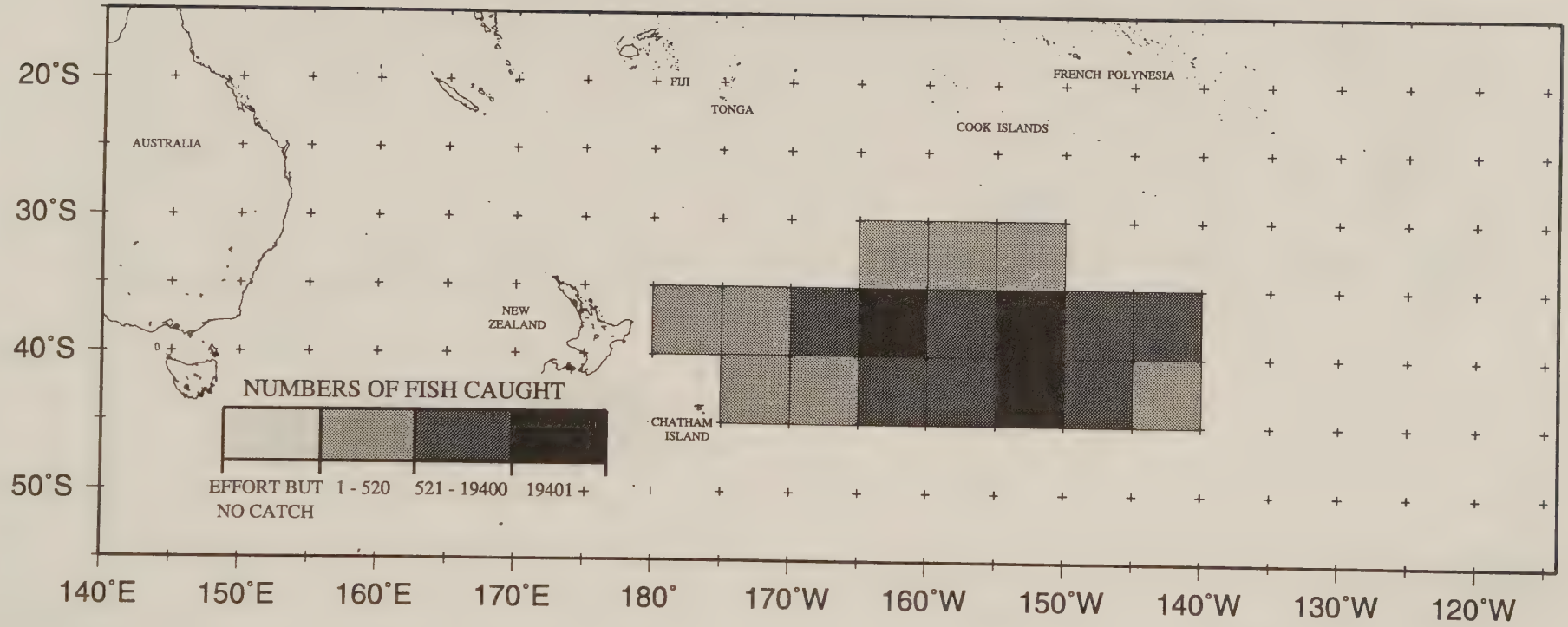

Figure 2a. Catches of albacore in the South Pacific for the 1995-96 season.

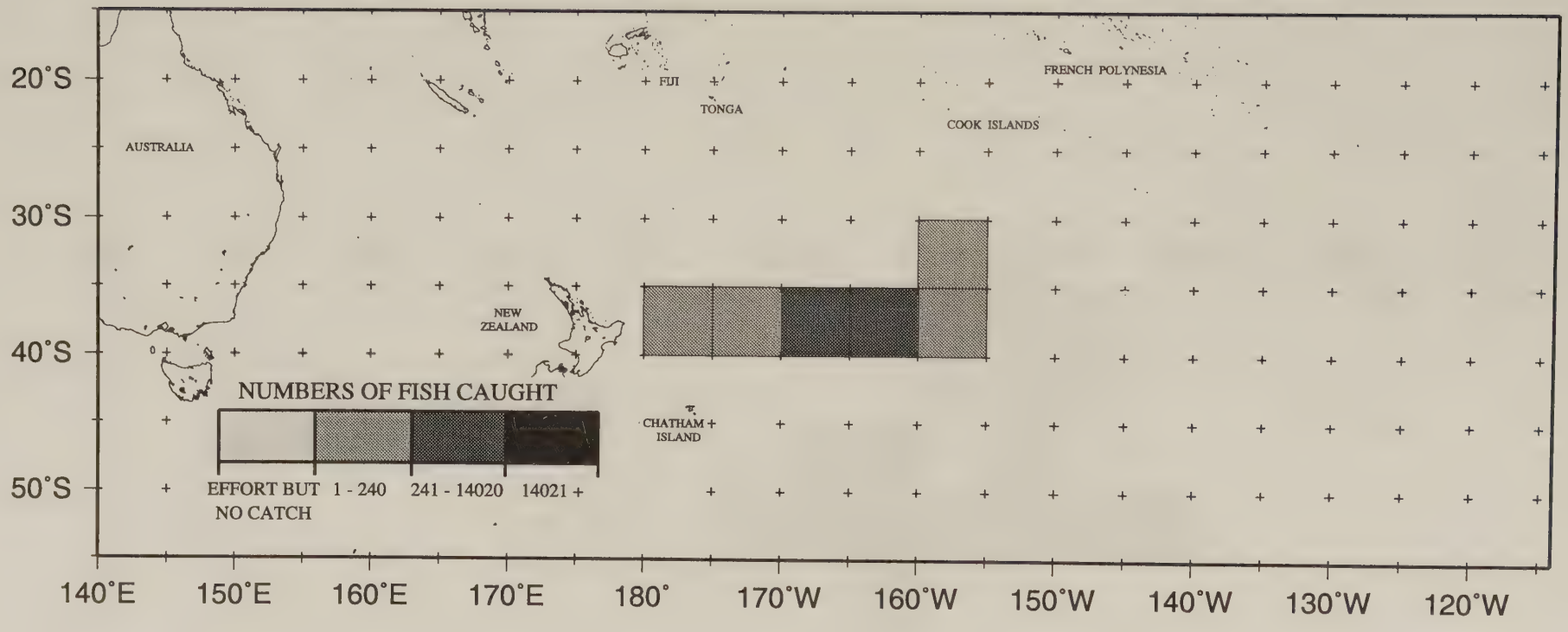

Figure 2b. Catches of albacore in the South Pacific for December 1995.

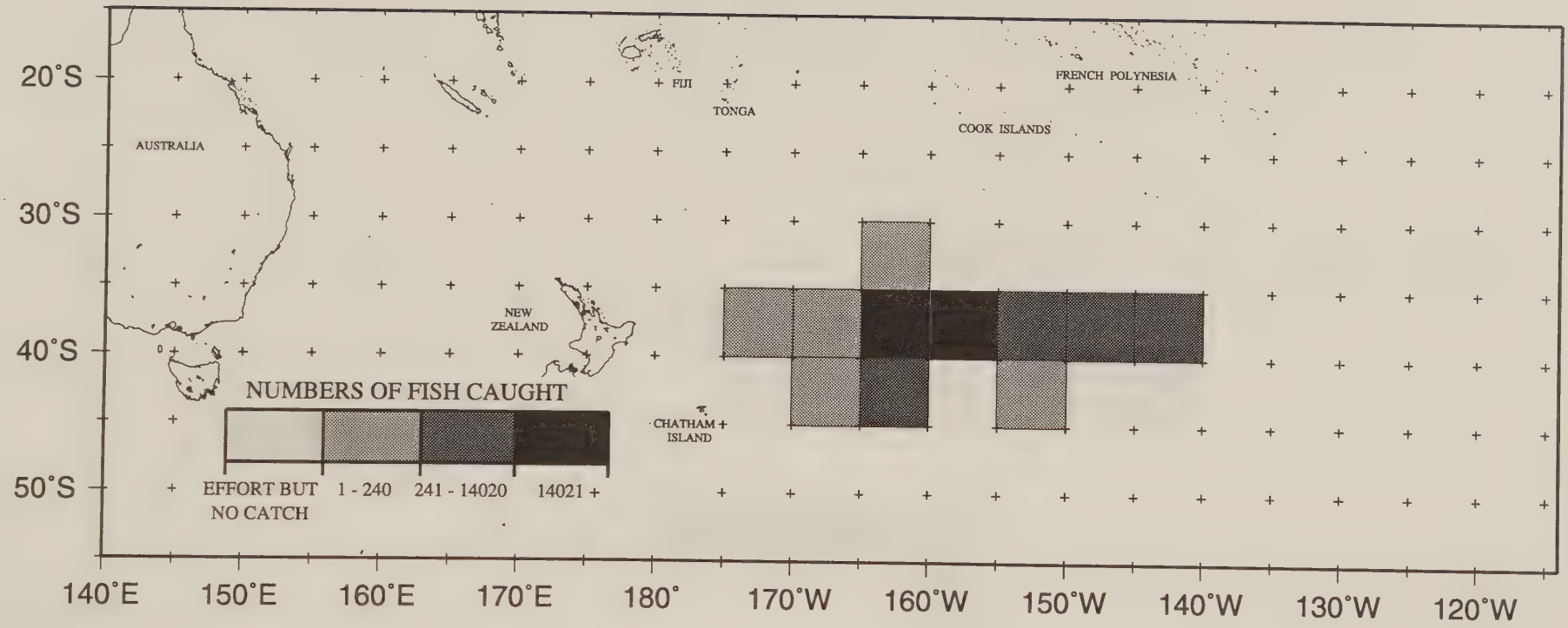

Figure 2c. Catches of albacore in the South Pacific for January 1996.

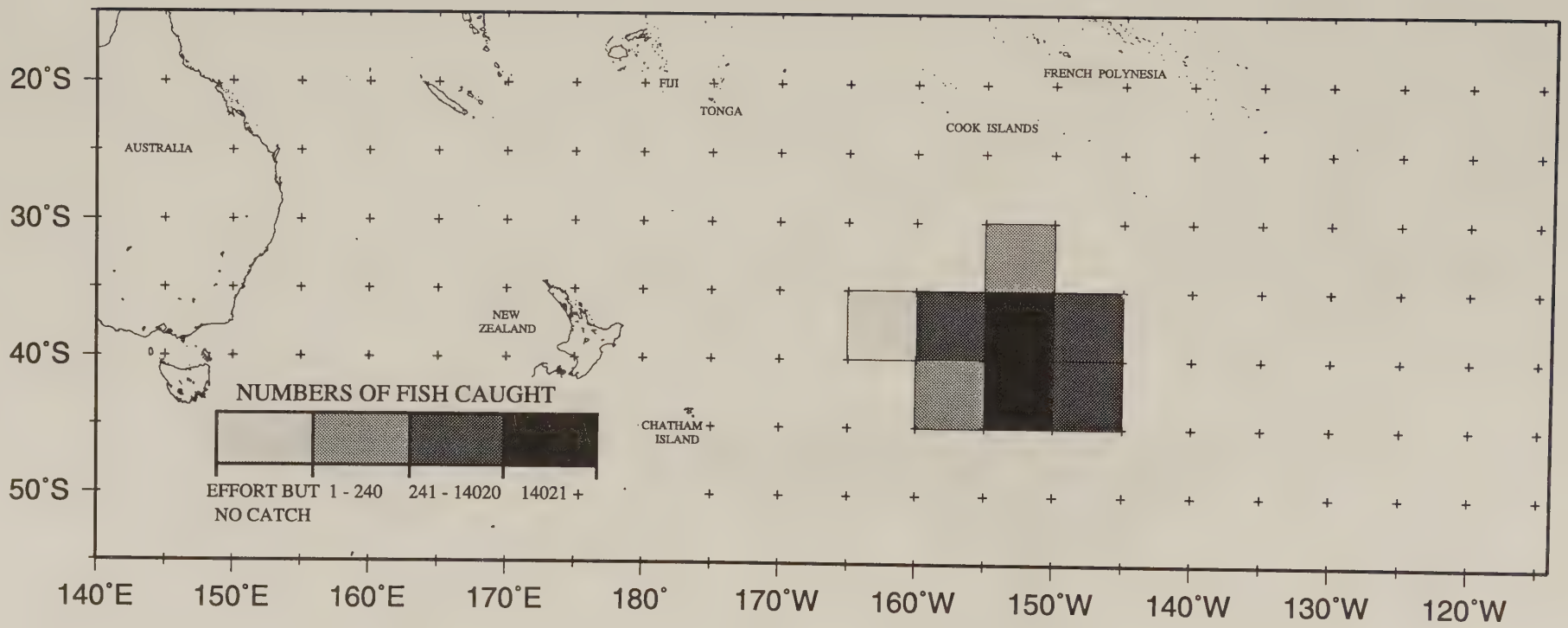

Figure 2d. Catches of albacore in the South Pacific for February 1996.

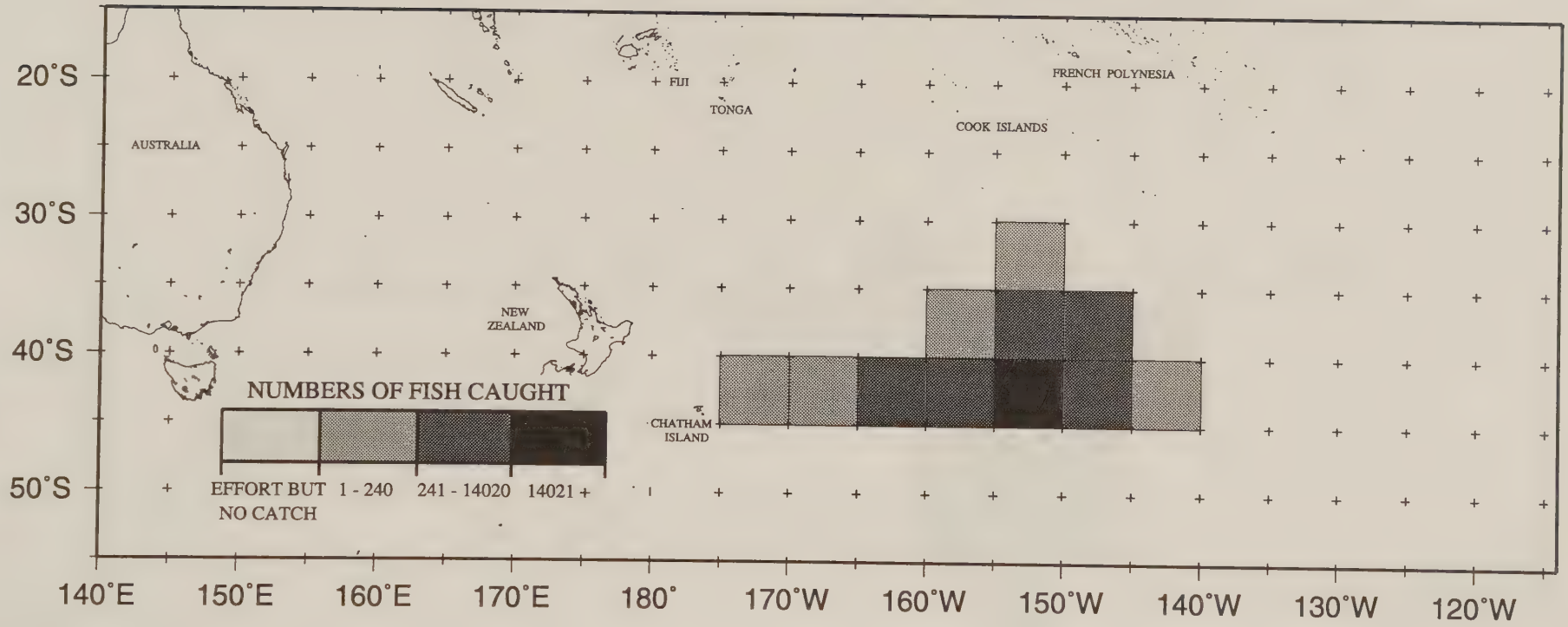

Figure 2e. Catches of albacore in the South Pacific for March 1996.

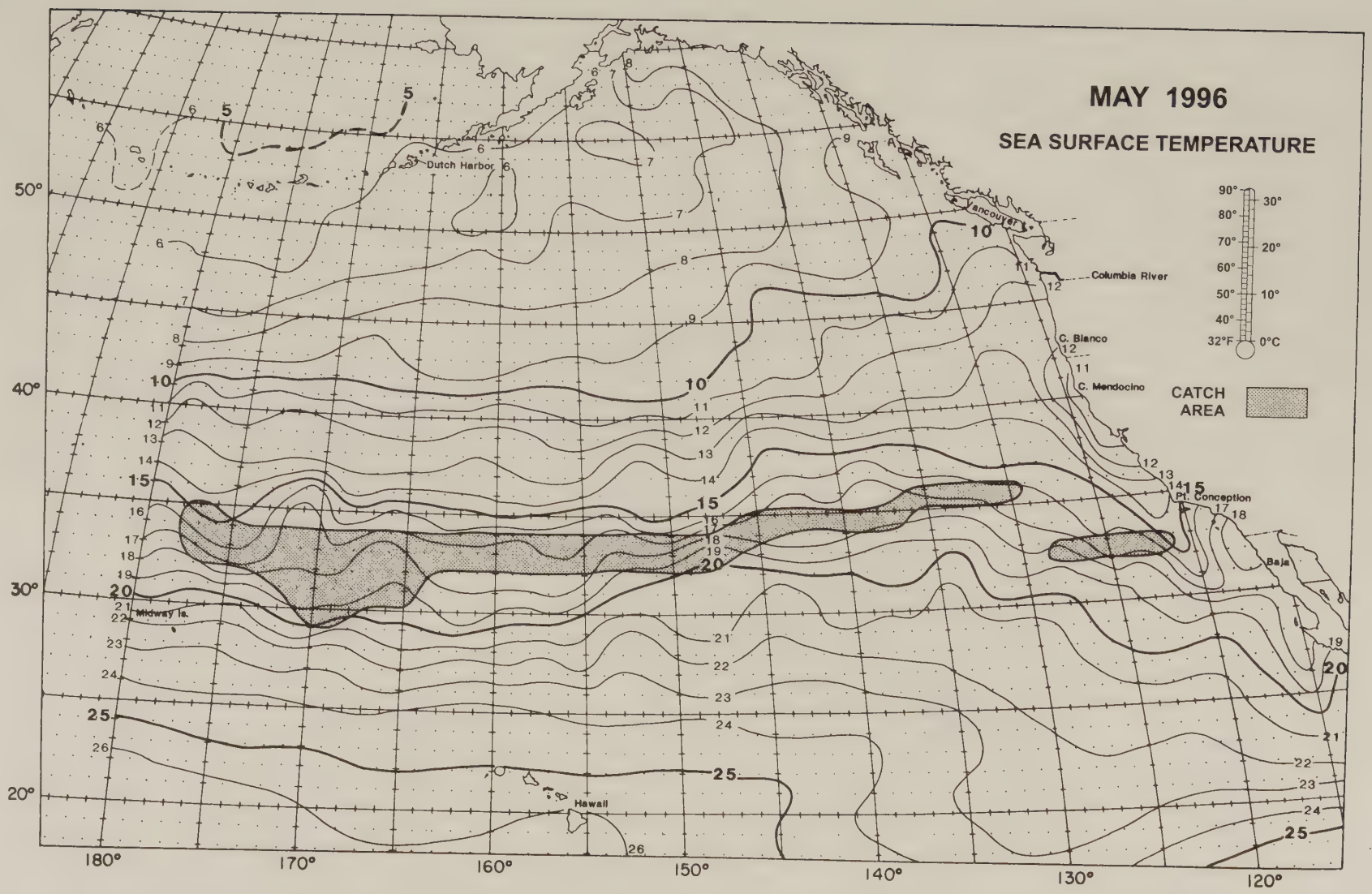

Figure 3a. Average SST isotherms and general catch area of North Pacific albacore troll fleet for May 1996.

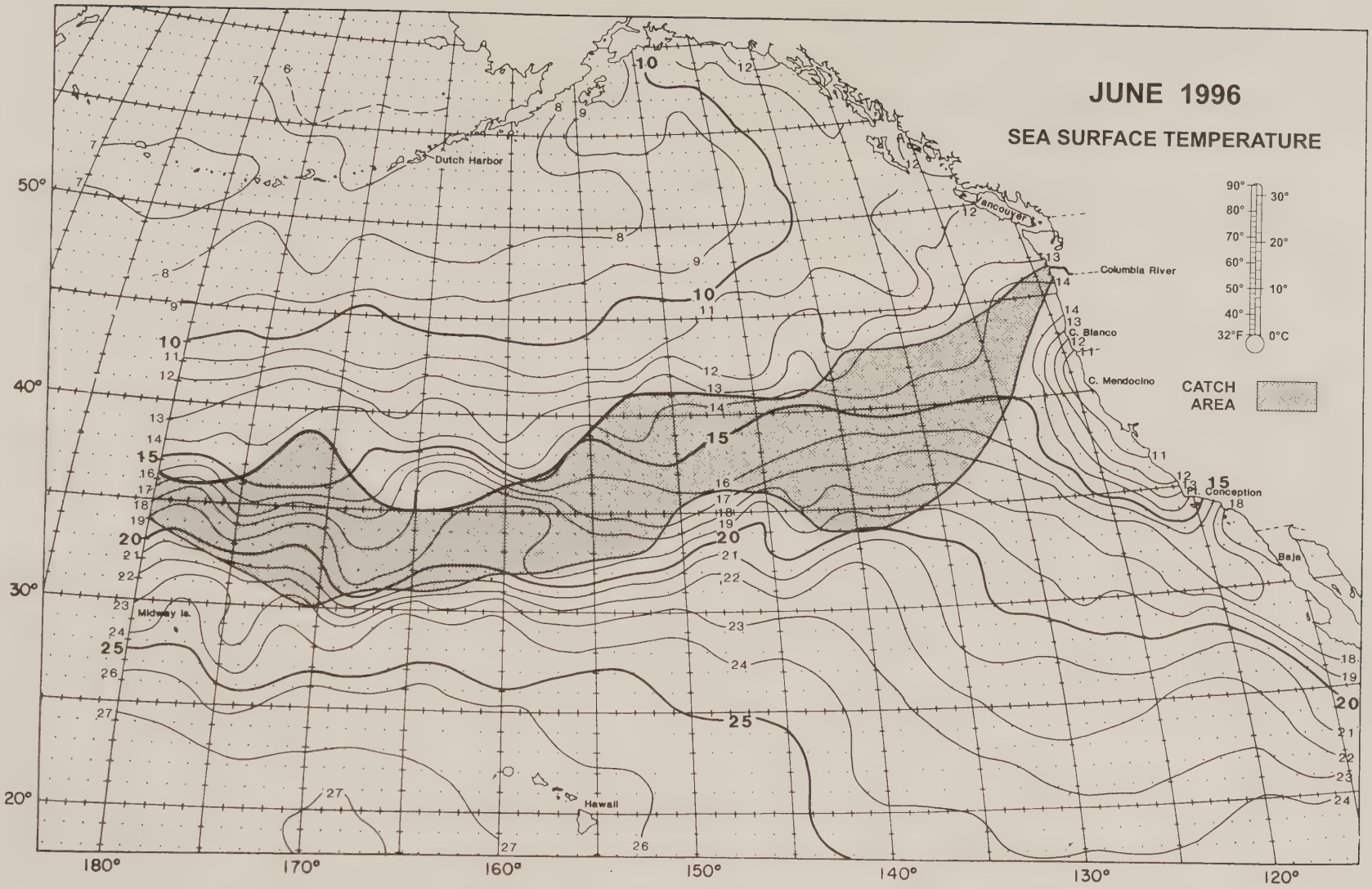

Figure 3b. Average SST isotherms and general catch area of North Pacific albacore troll fleet for June 1996.

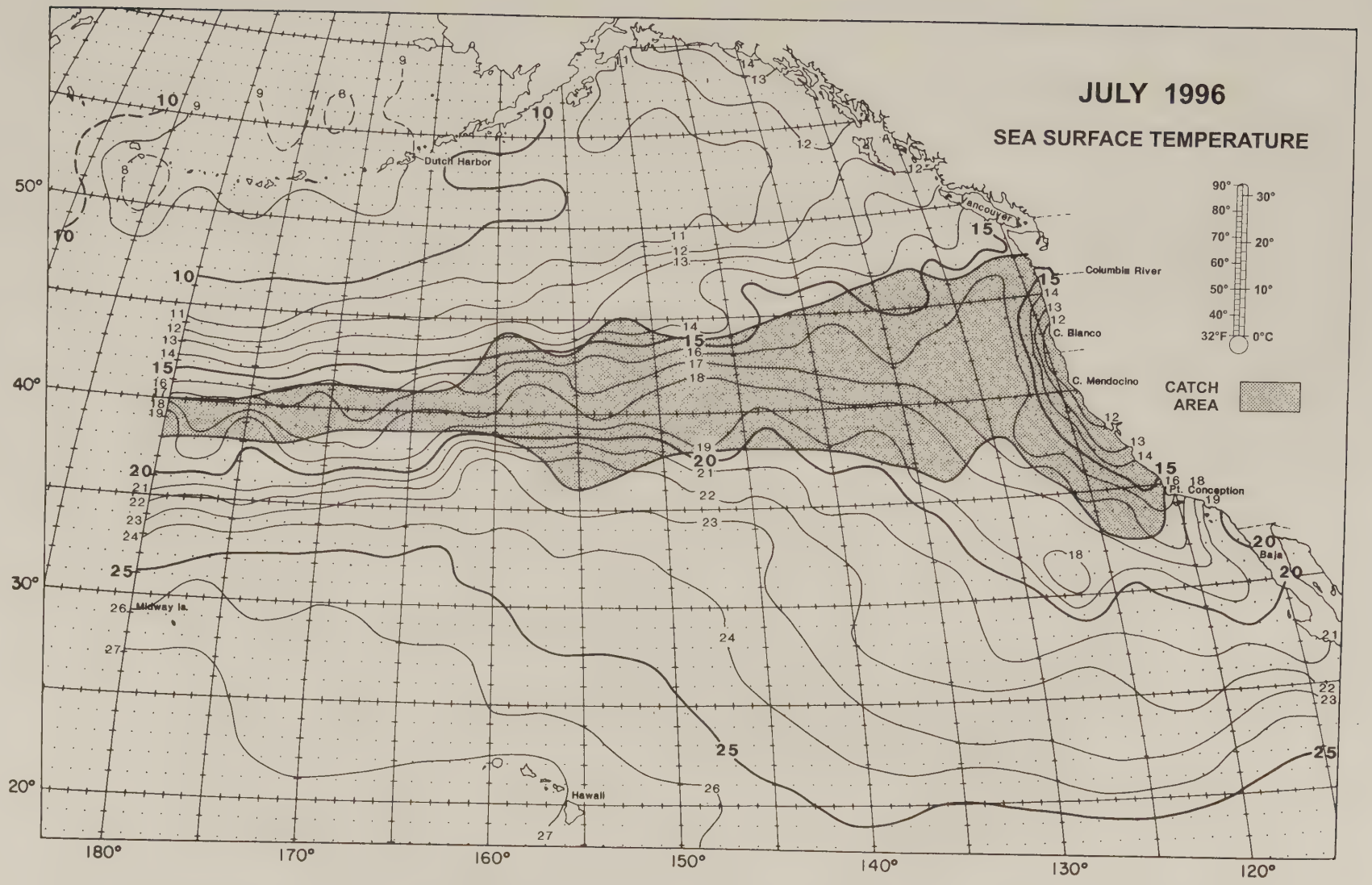

Figure 3c. Average SST isotherms and general catch area of North Pacific albacore troll fleet for July 1996.

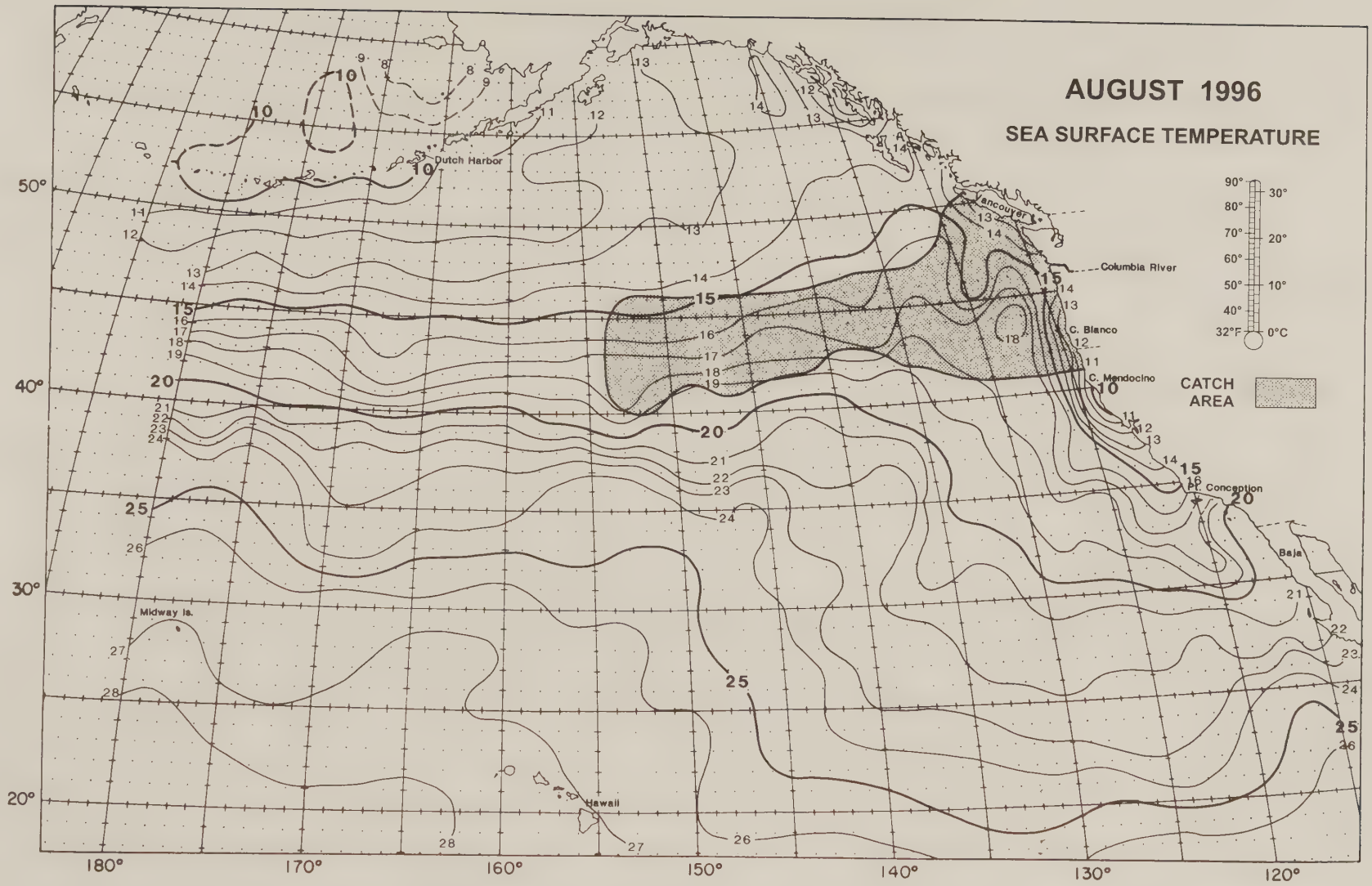

Figure 3d. Average SST isotherms and general catch area of North Pacific albacore troll fleet for August 1996.

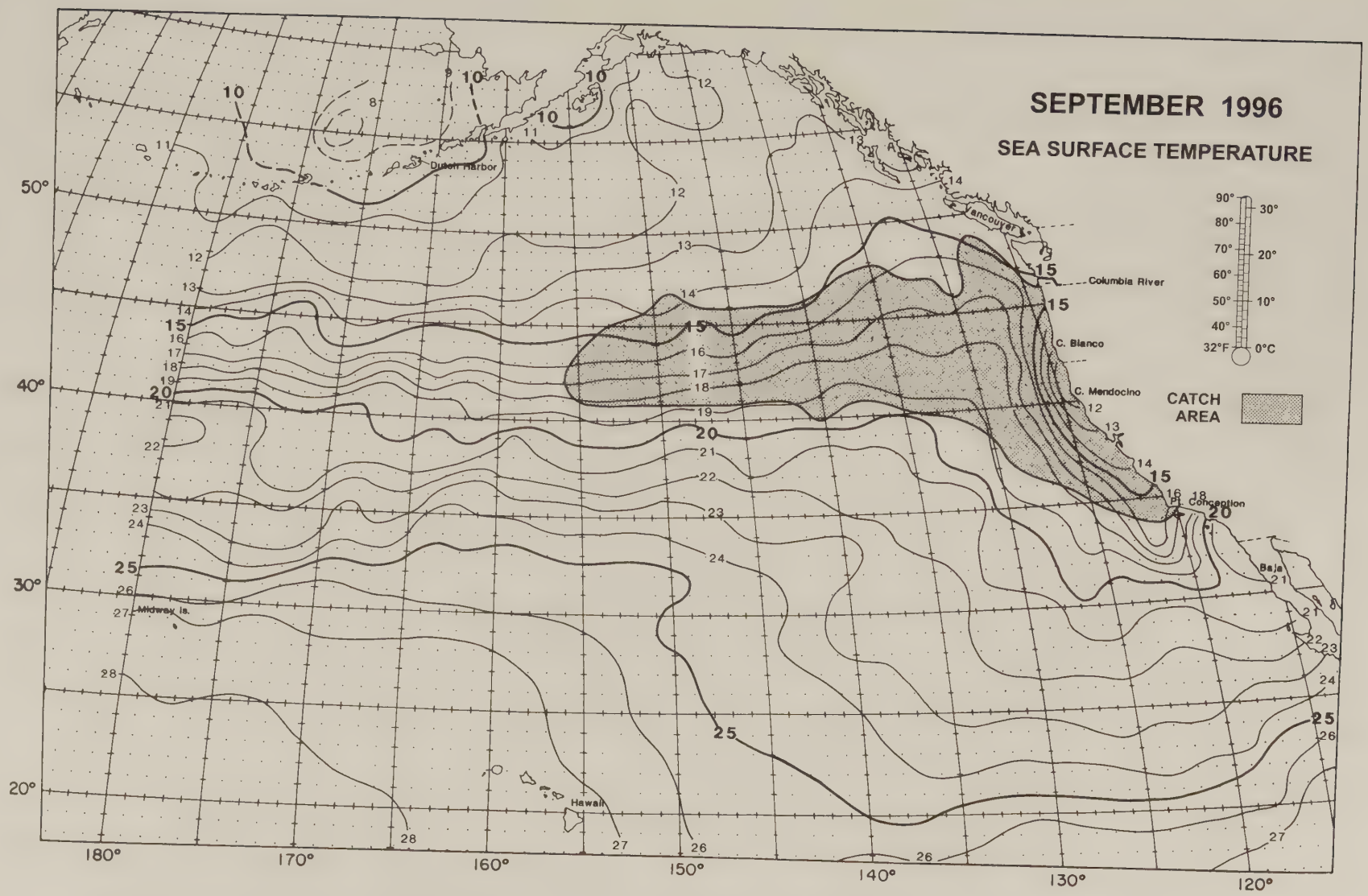

Figure 3e. Average SST isotherms and general catch area of North Pacific albacore troll fleet for September 1996.

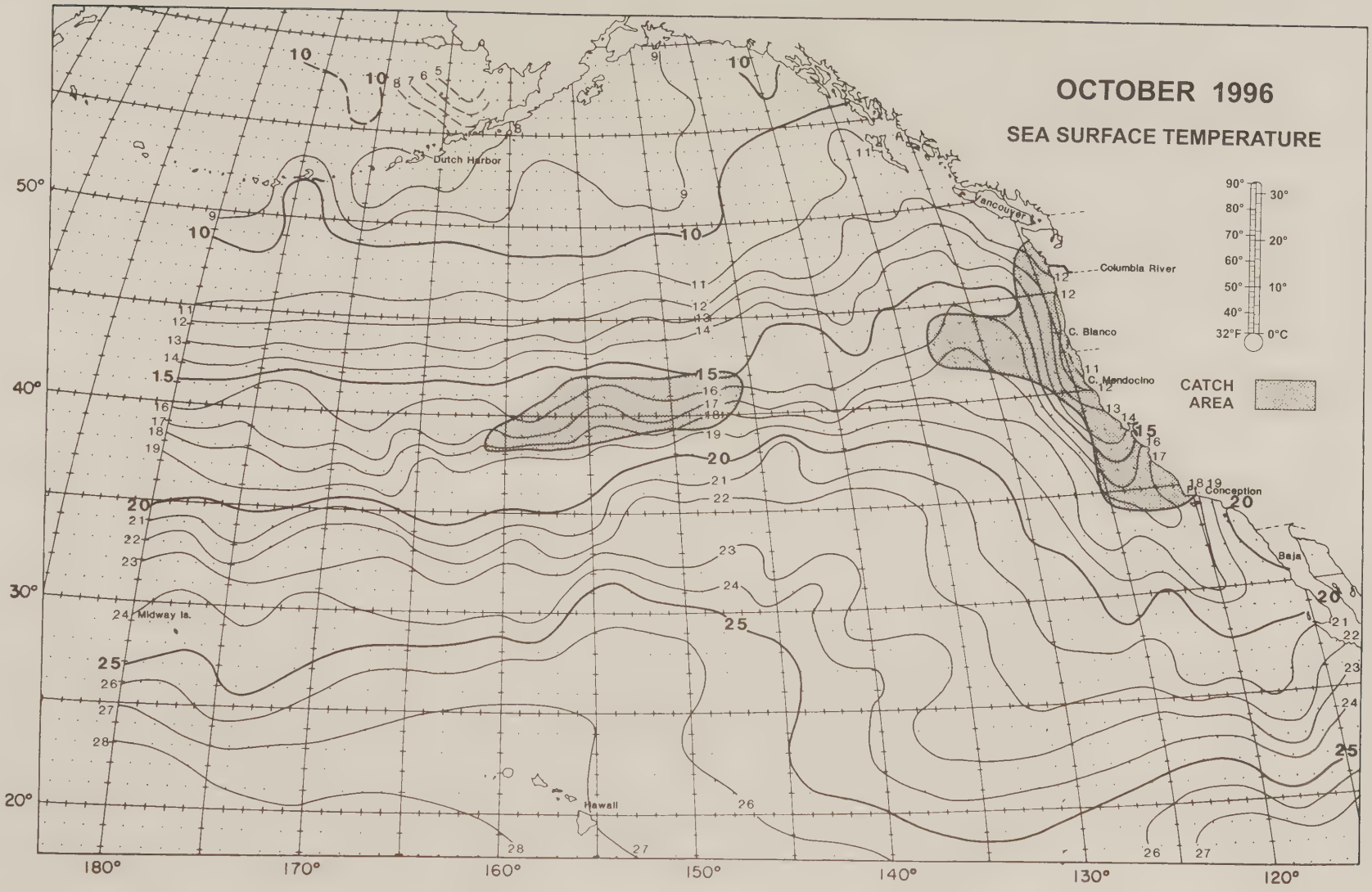

Figure 3f. Average SST isotherms and general catch area of North Pacific albacore troll fleet for October 1996.

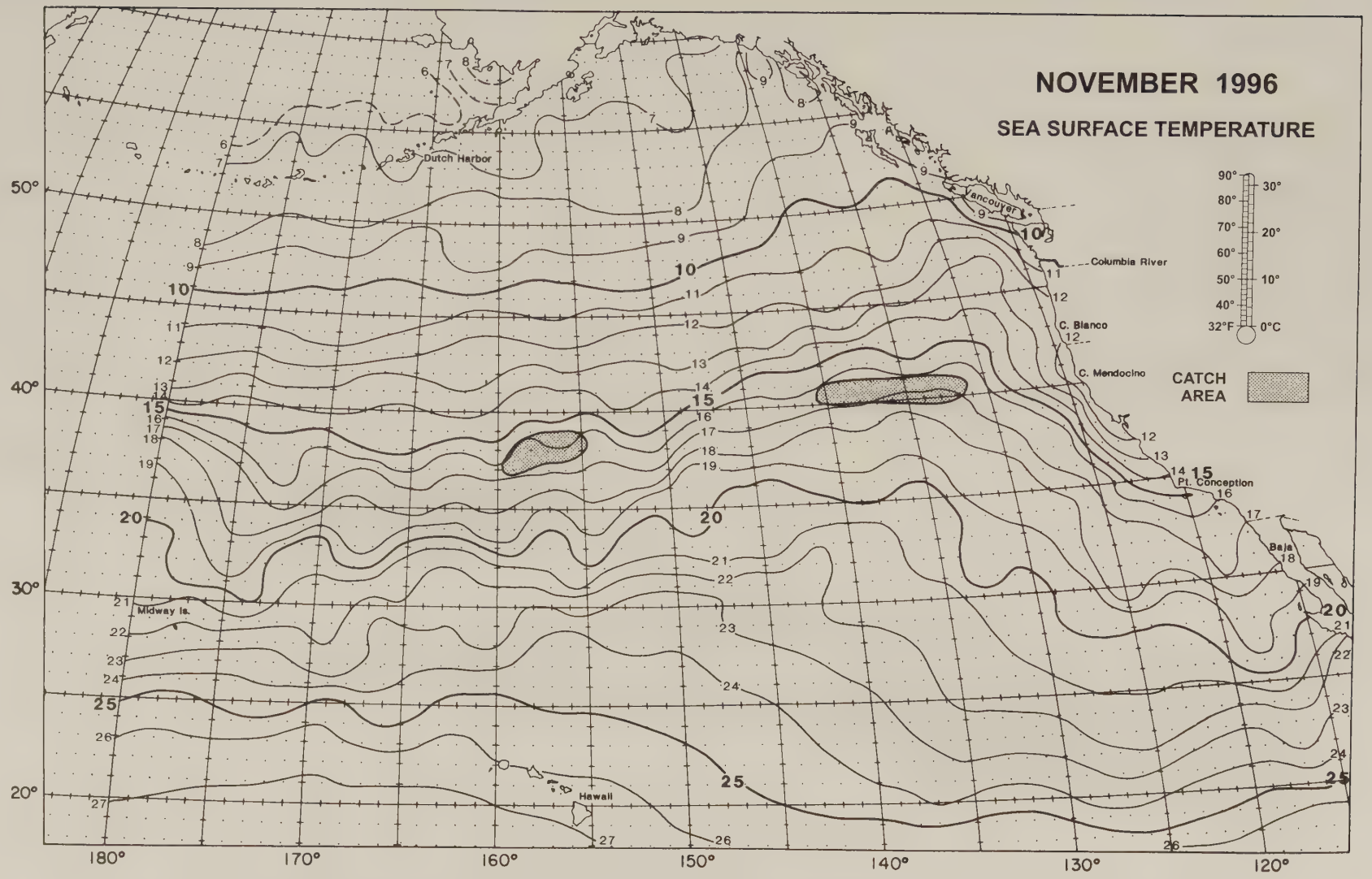

Figure 3g. Average SST isotherms and general catch area of North Pacific albacore troll fleet for November 1996.

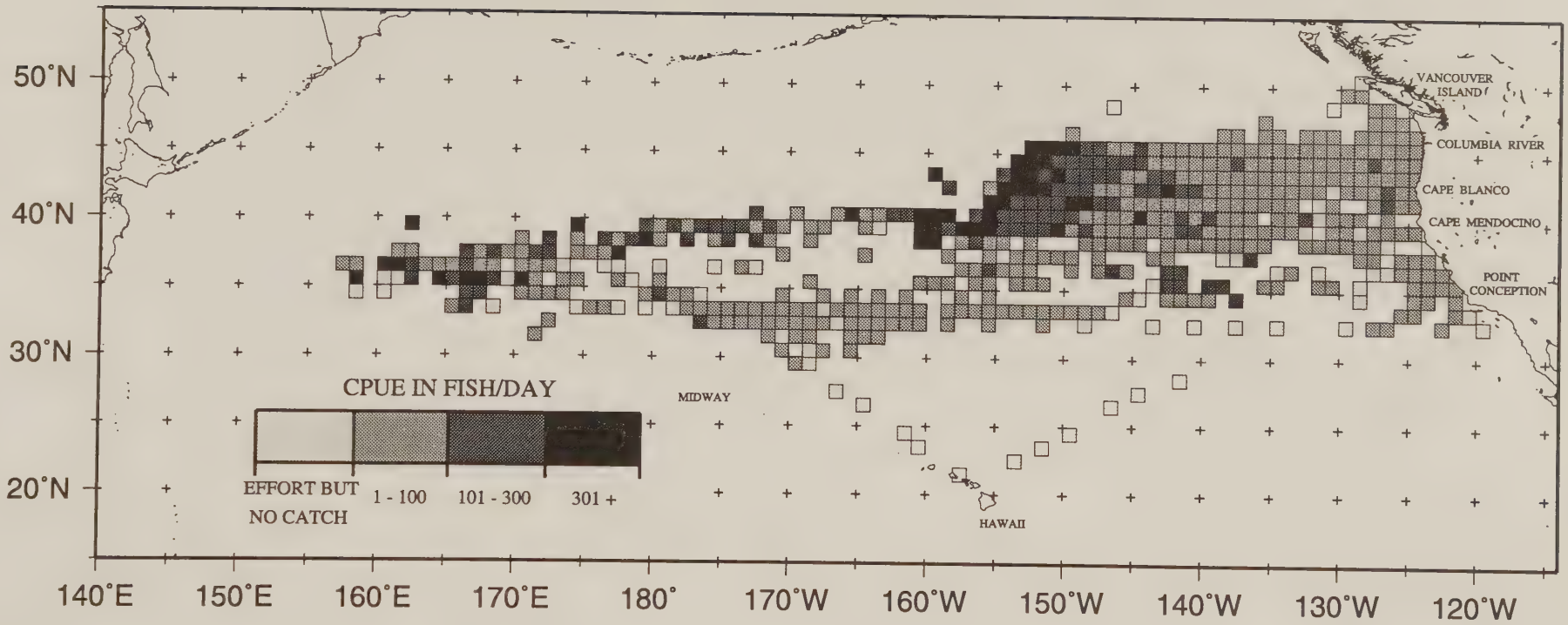

Figure 4a. Albacore CPUEs in the North Pacific for the 1996 season.

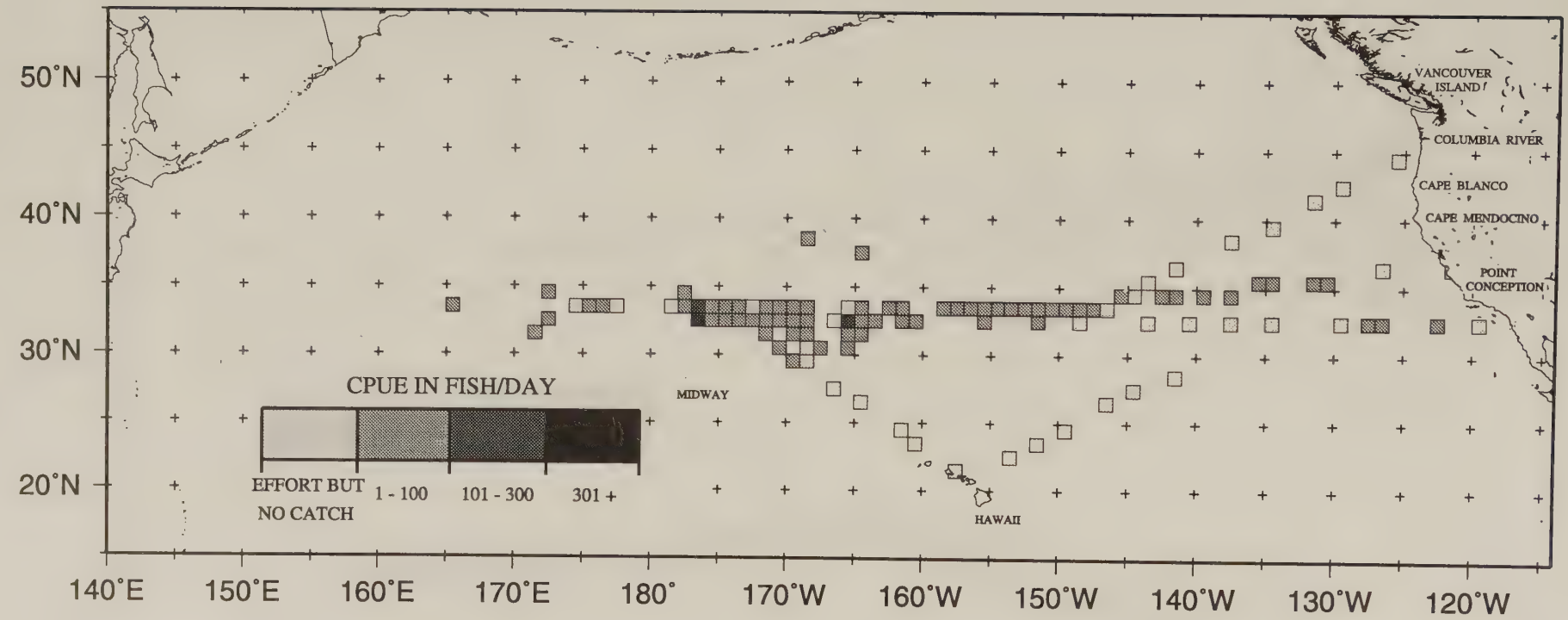

Figure 4b. Albacore CPUEs in the North Pacific for May 1996.

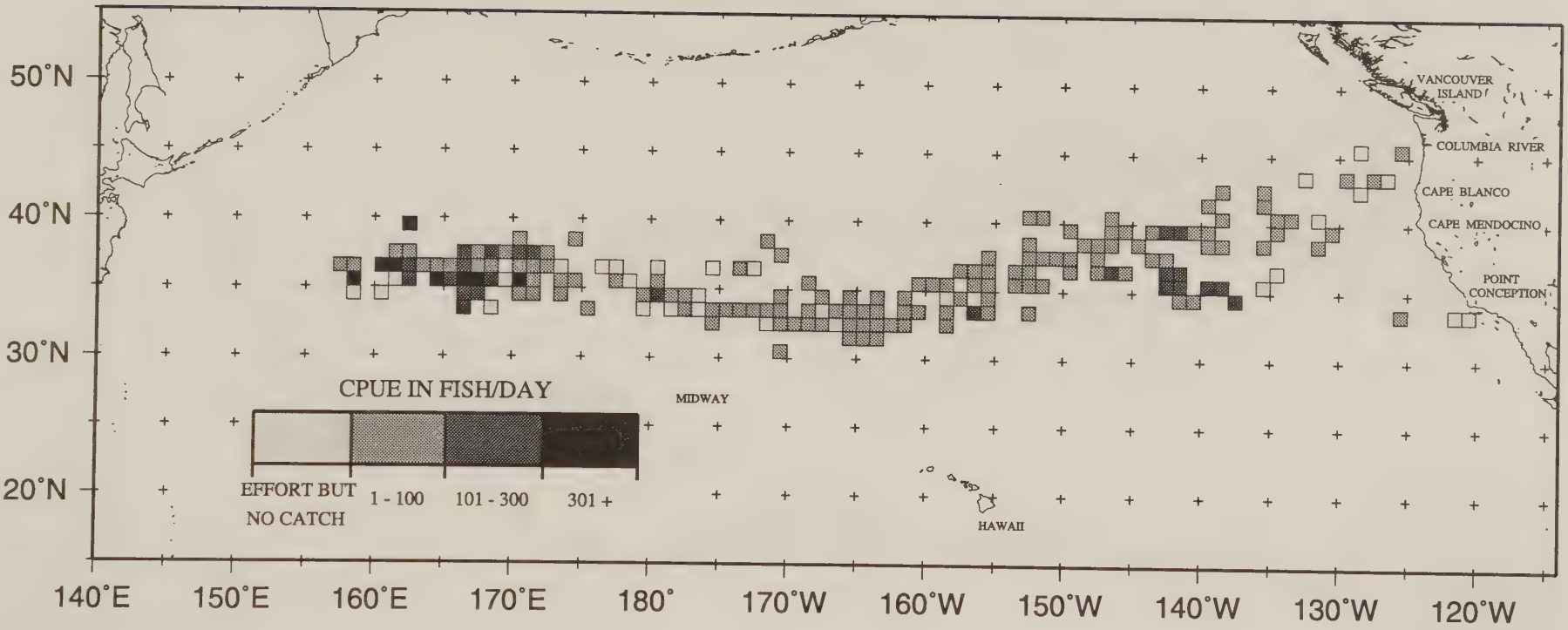

Figure 4c. Albacore CPUEs in the North Pácific for June 1996.

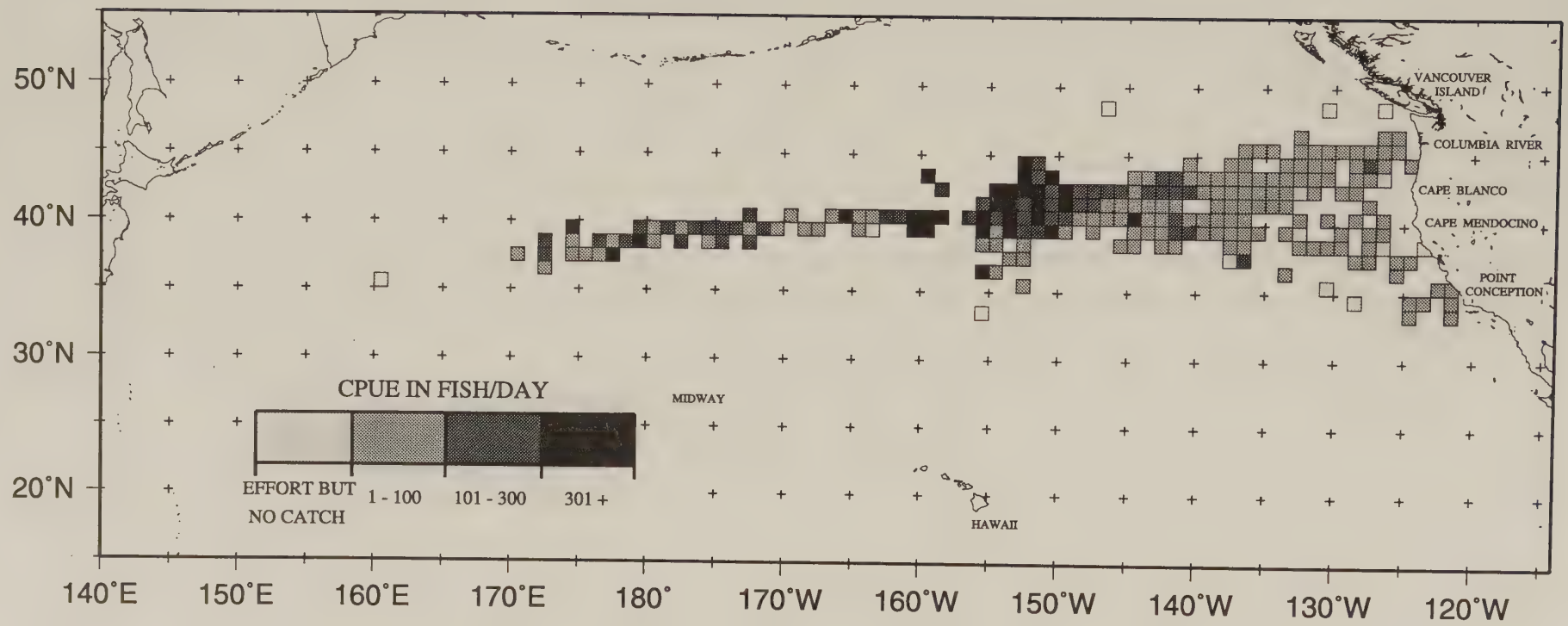

Figure 4d. Albacore CPUEs in the North Pacific for July 1996.

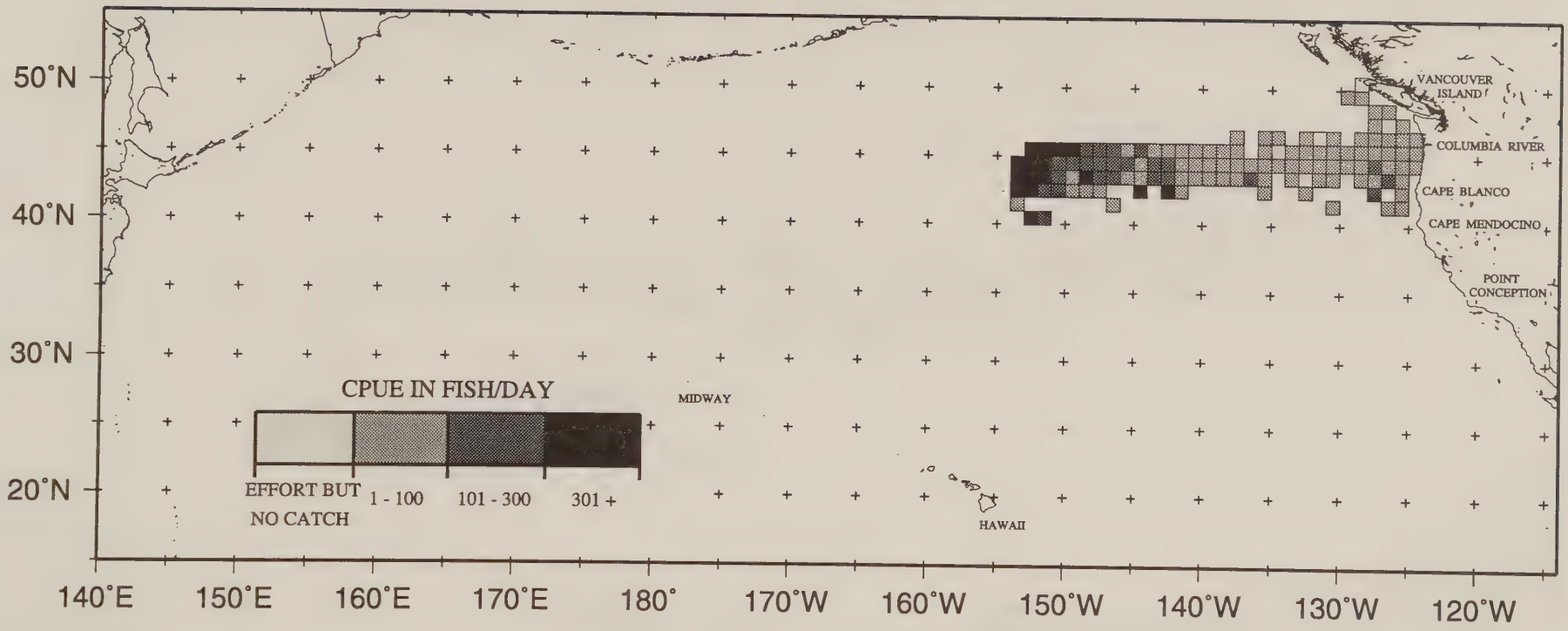

Figure 4e. Albacore CPUEs in the North Pacific for August 1996.

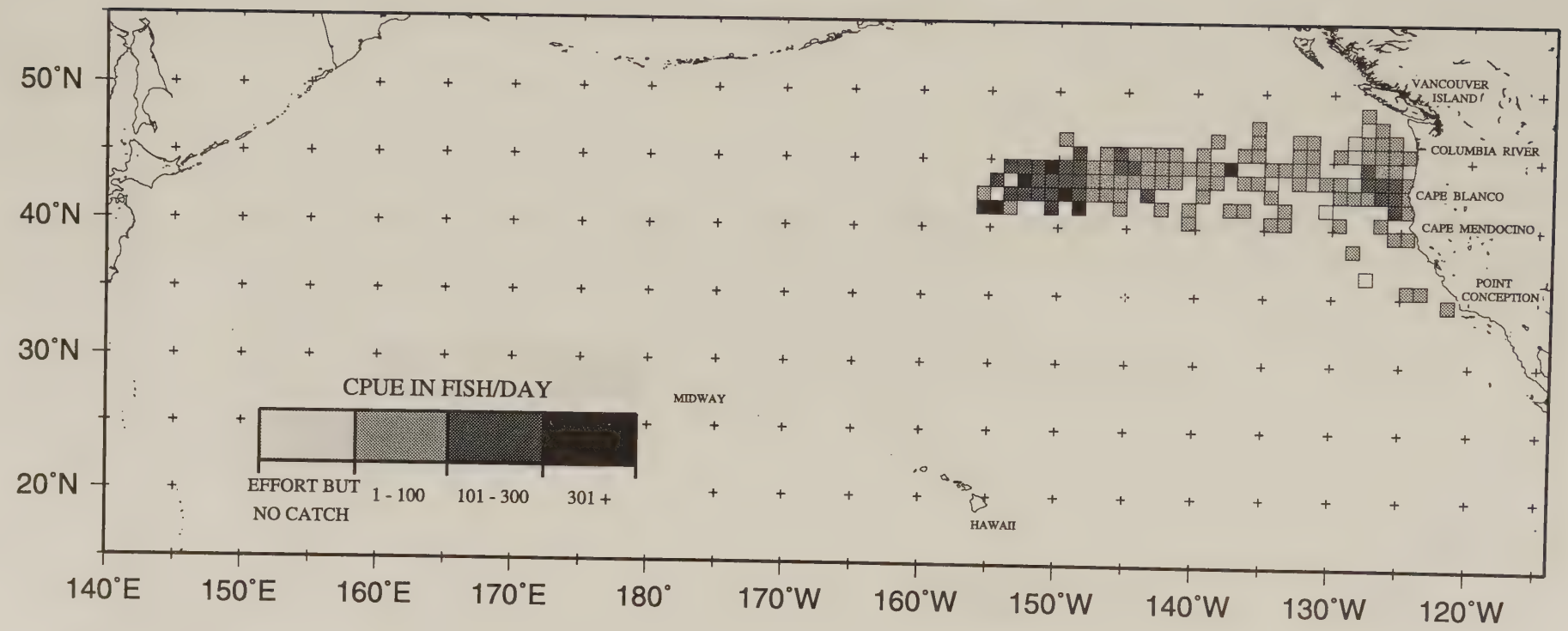

Figure 4f. Albacore CPUEs in the North Pacific for September 1996.

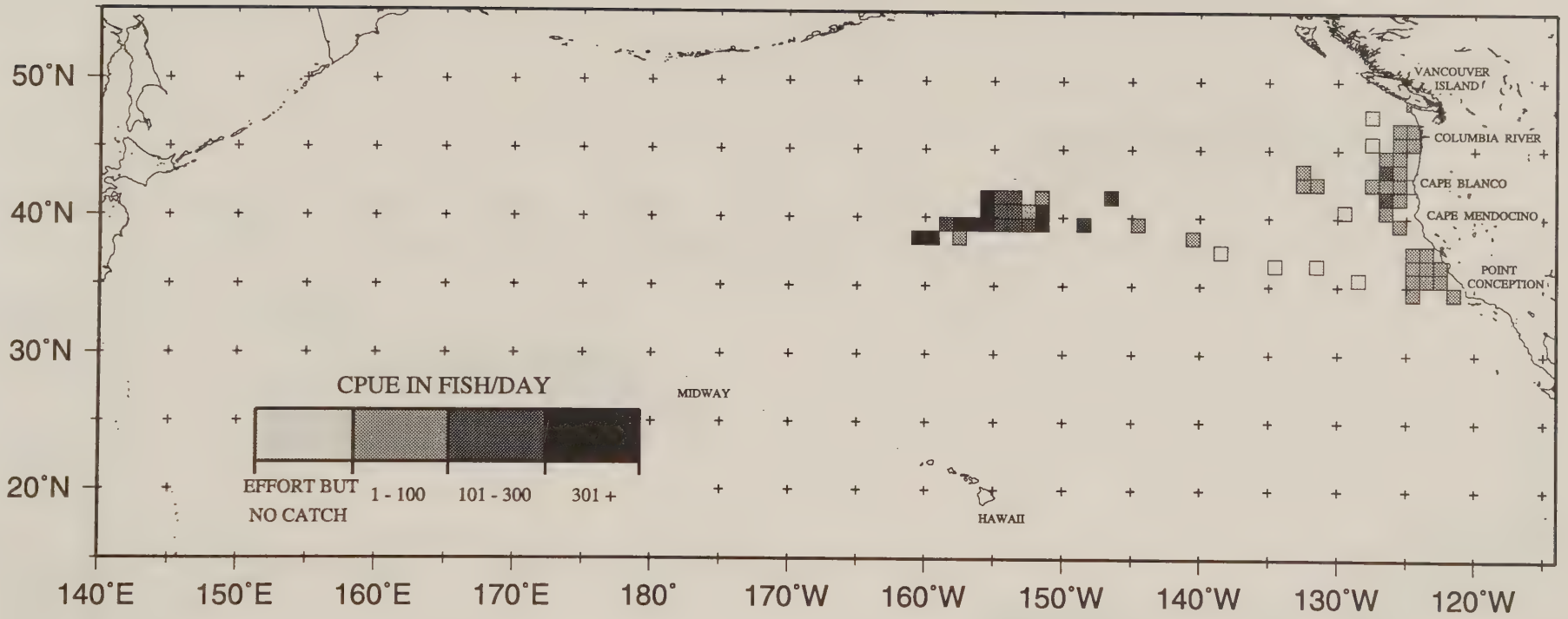

Figure 4g. Albacore CPUEs in the North Pacific for October 1996.

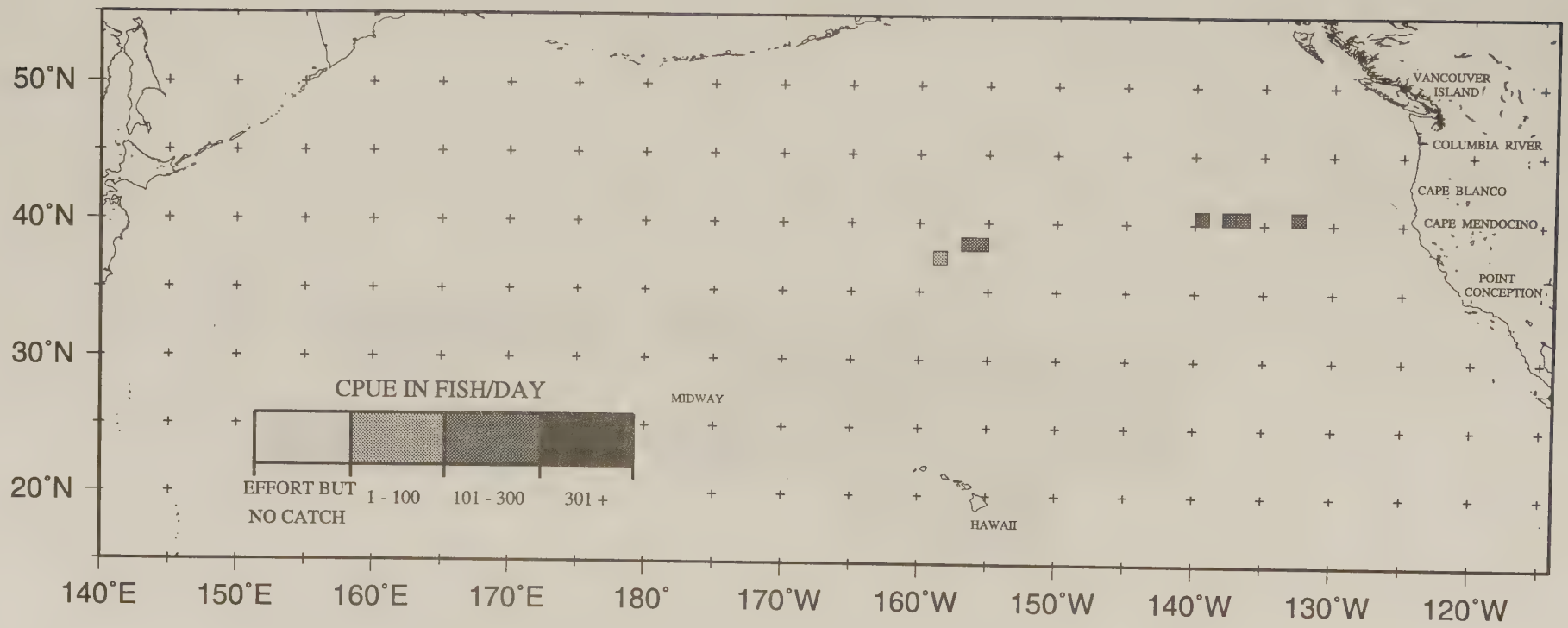

Figure 4h. Albacore CPUEs in the North Pacific for November 1996.

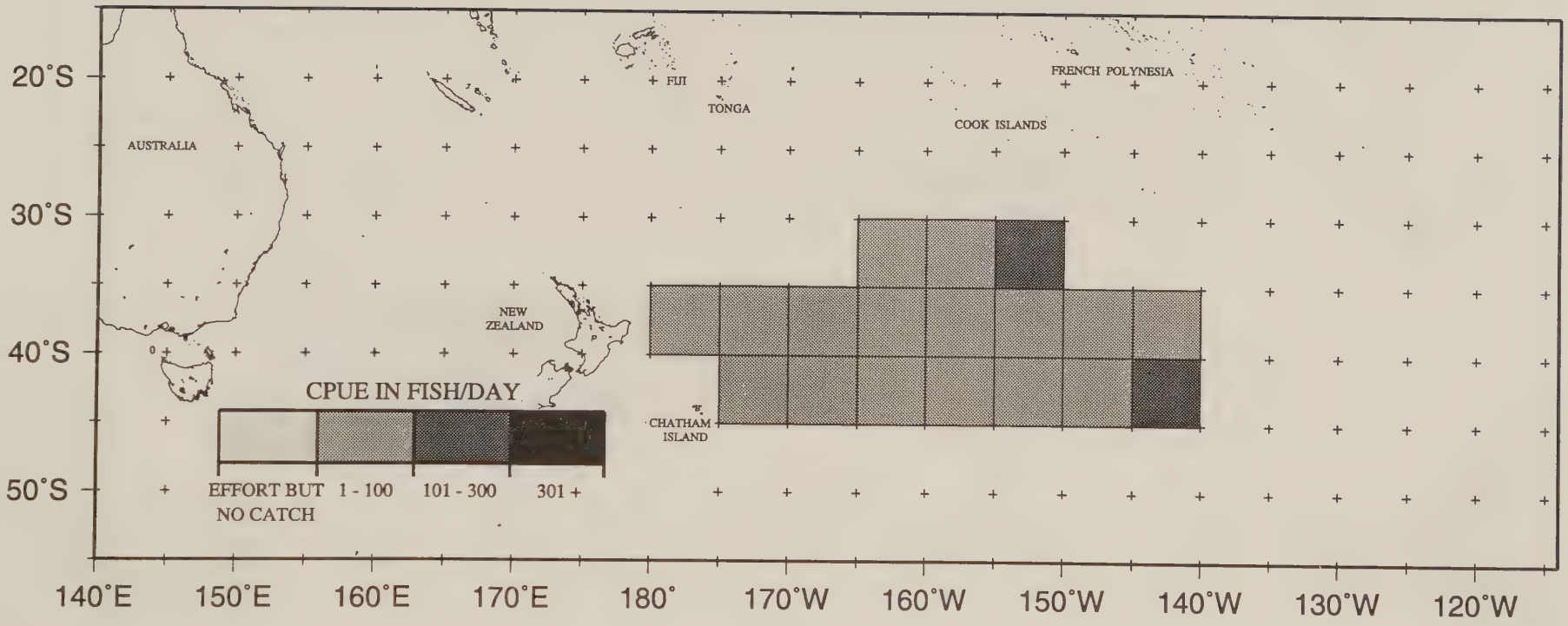

Figure 5a. Albacore CPUEs in the South Pacific for the 1995-96 season.

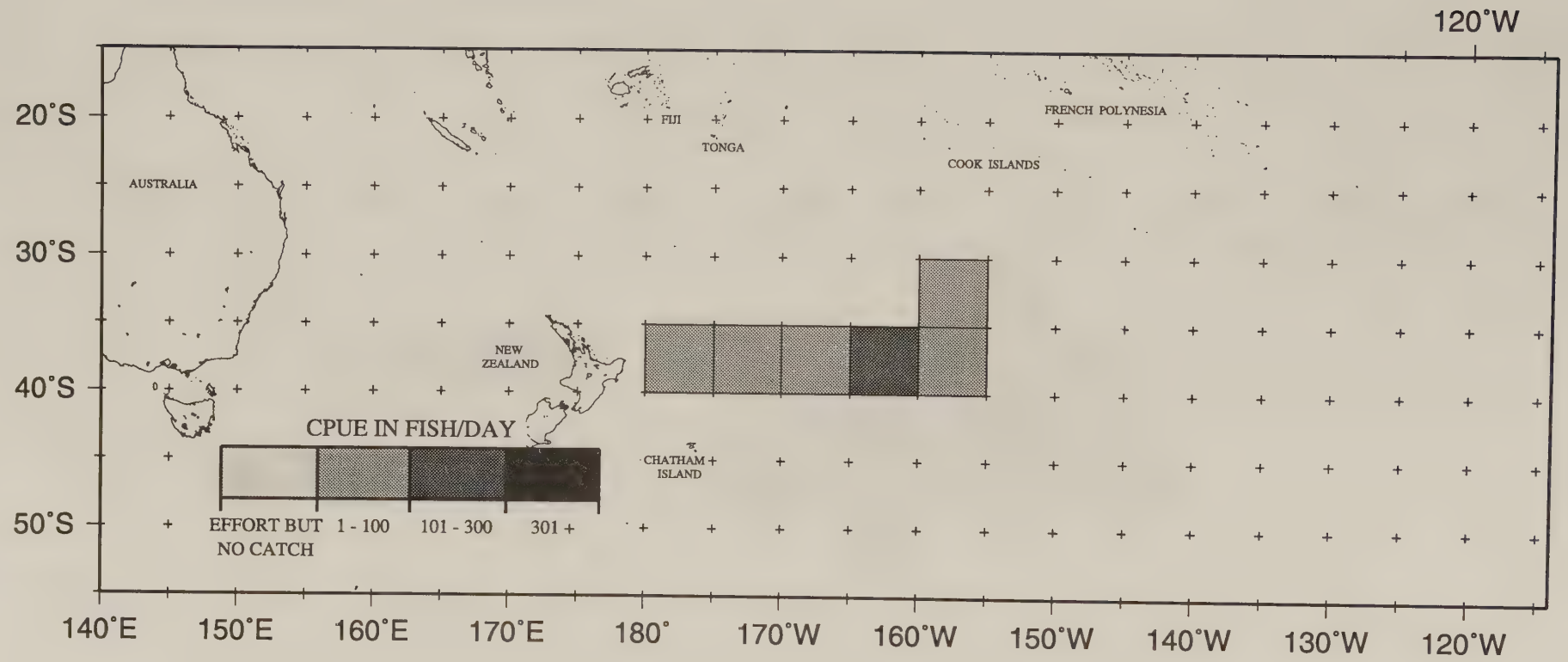

Figure 5b. Albacore CPUEs in the South Pacific for December 1995.

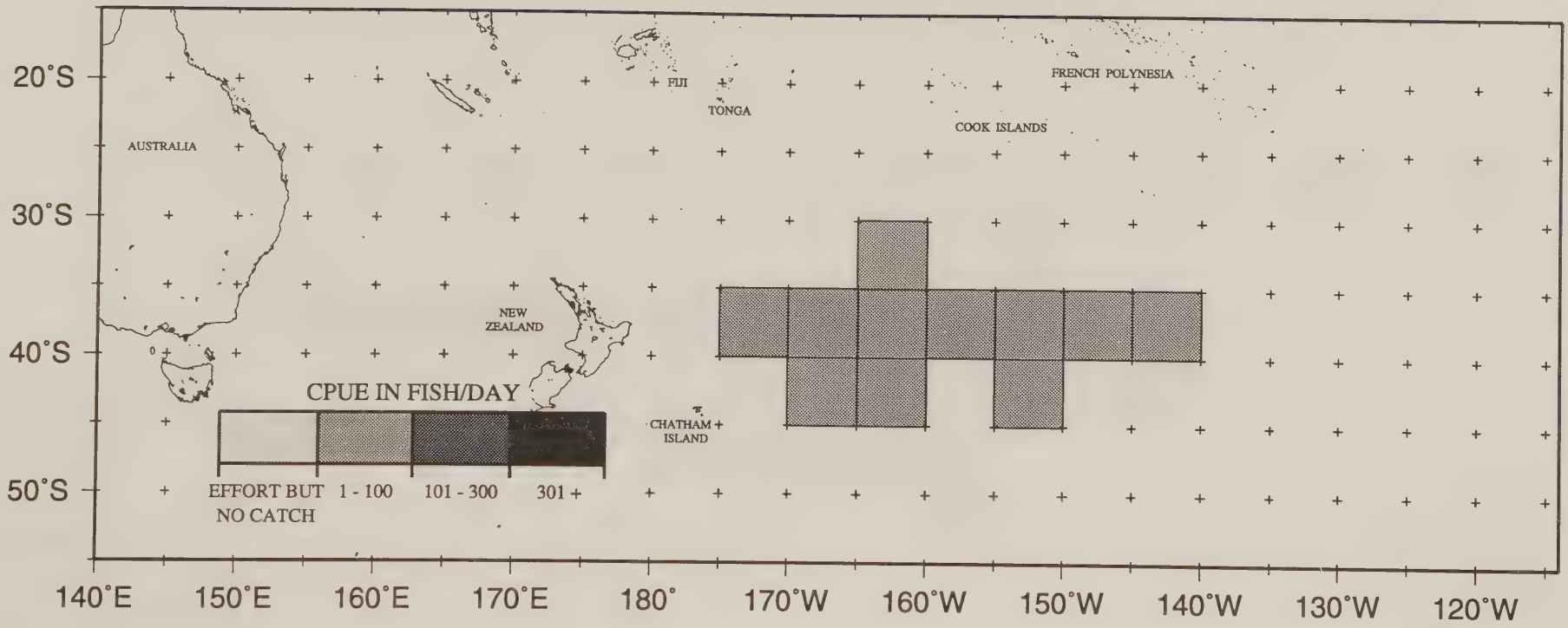

Figure 5c. Albacore CPUEs in the South Pacific for January 1996.

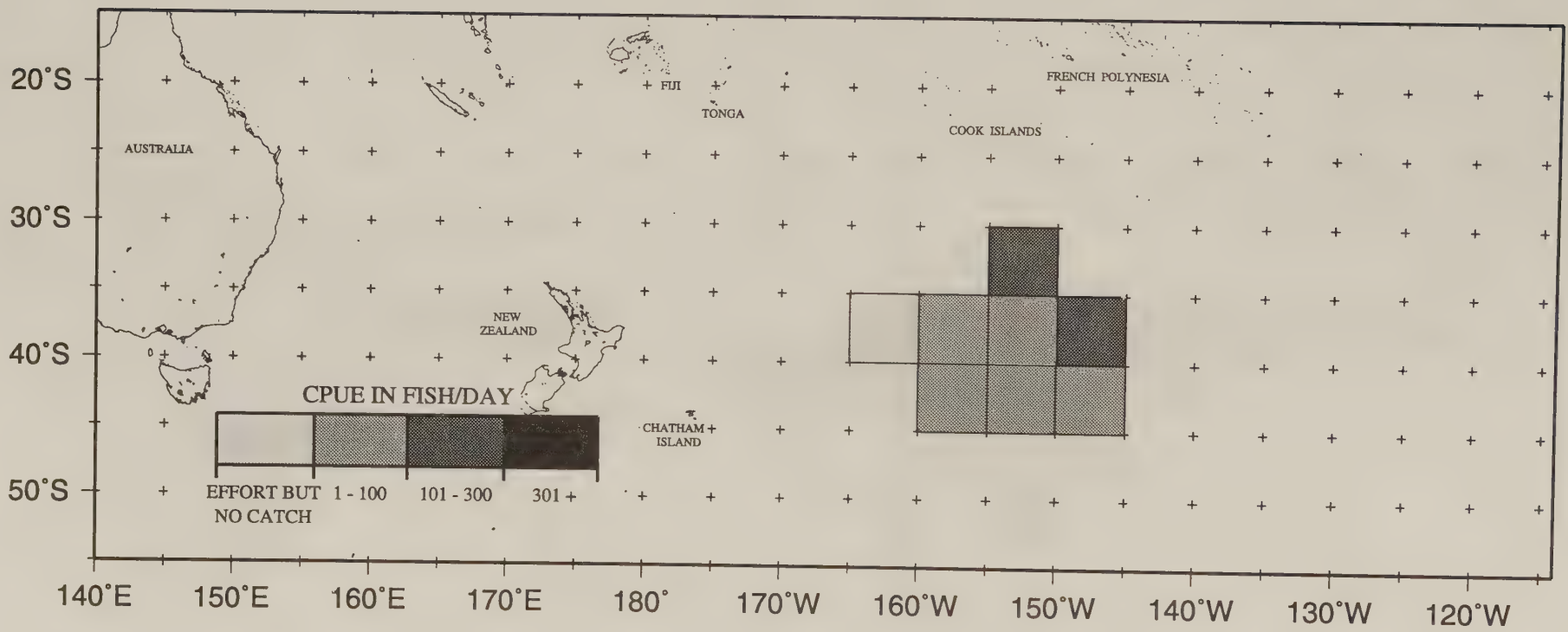

Figure 5d. Albacore CPUEs in the South Pacific for February 1996.

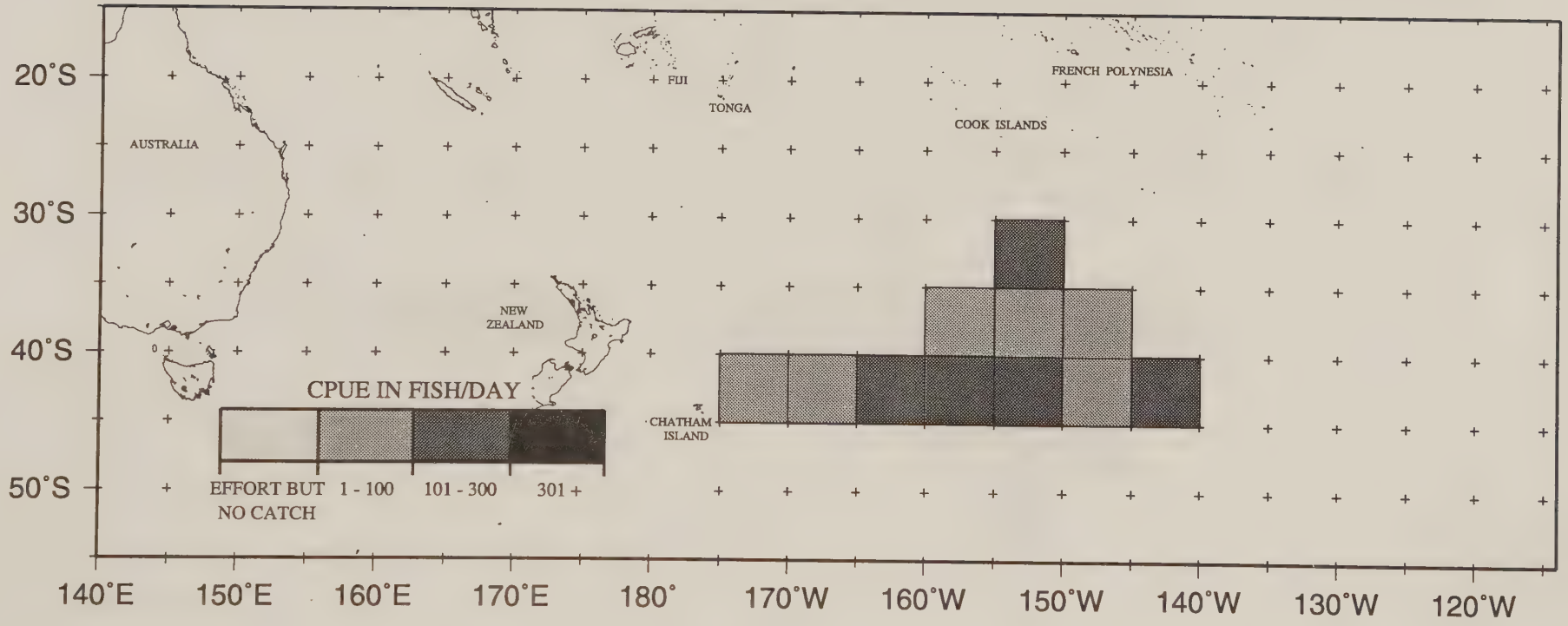

Figure 5e. Albacore CPUEs in the South Pacific for March 1996.

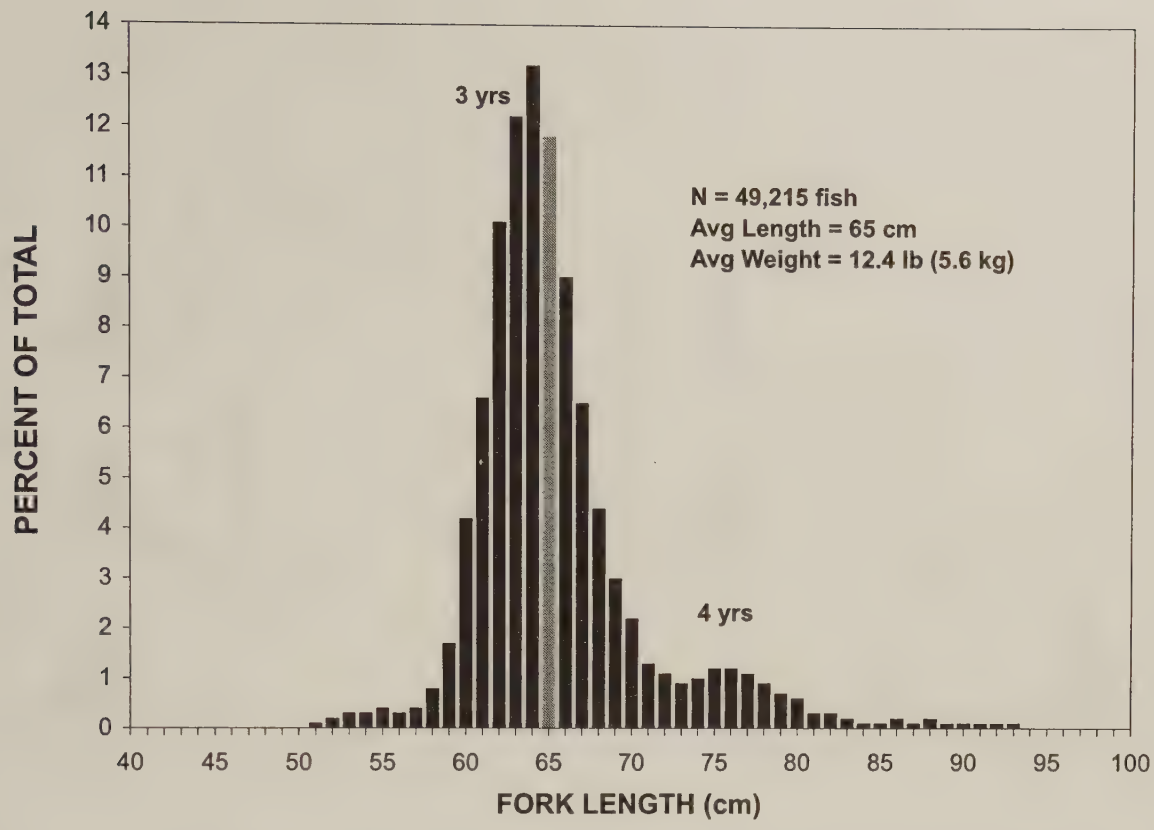

Figure 6. Length-frequencies of albacore sampled from the 1996 North Pacific troll fishery.

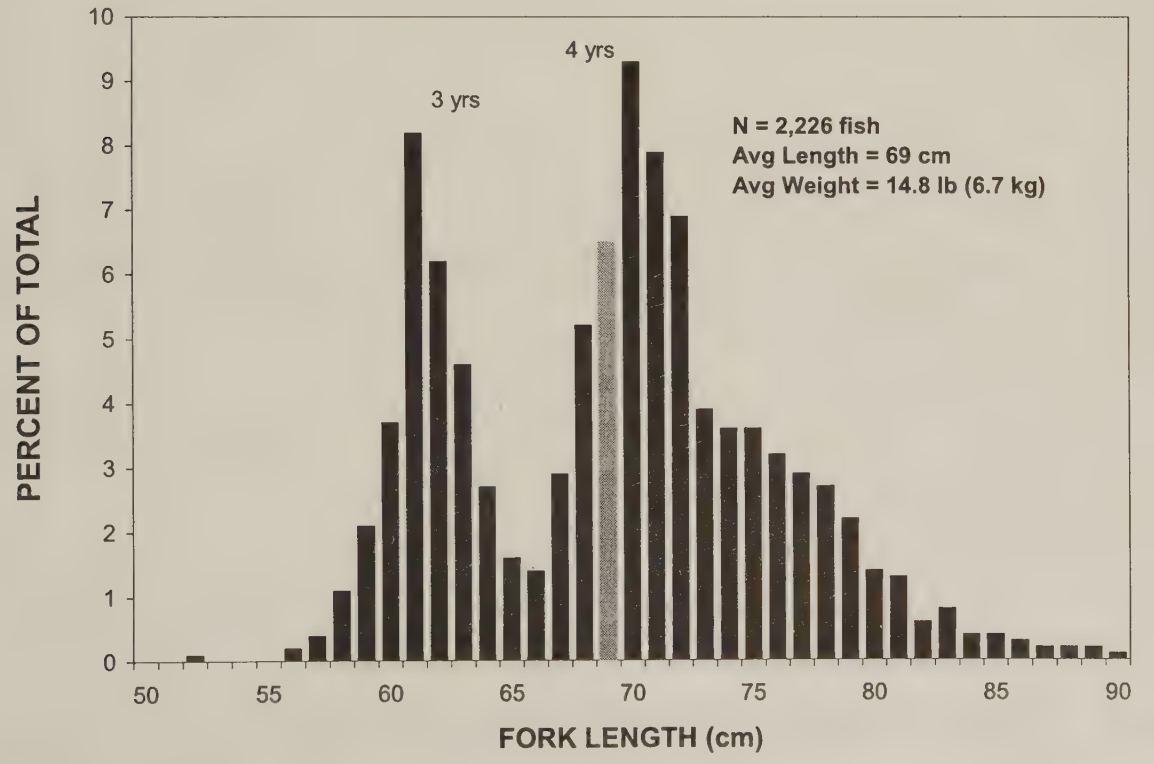

Figure 7. Length-frequencies of albacore sampled from the 1995-96 South Pacific troll fishery.

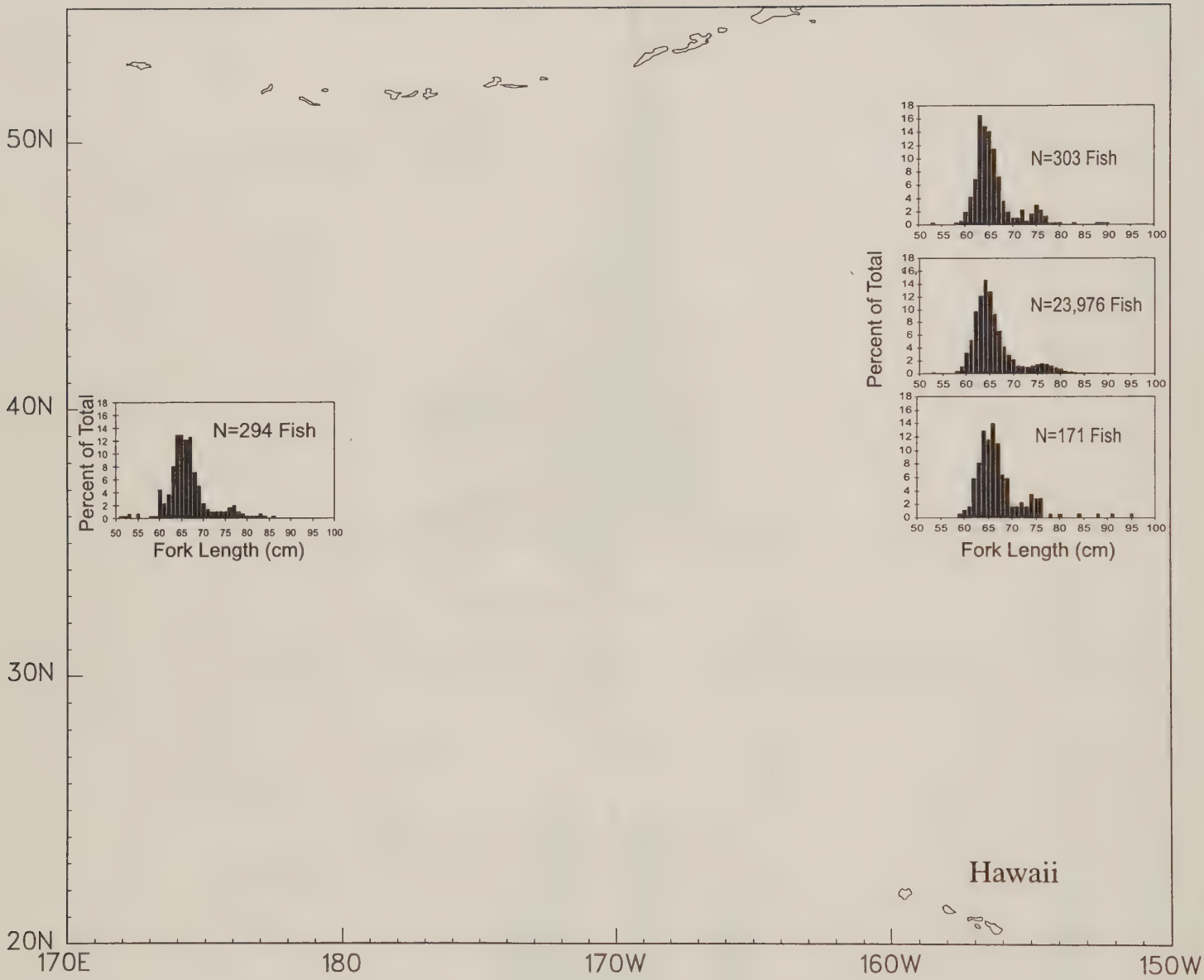

Figure 8. Geographic distribution of albacore length-frequencies from the 1996 North Pacific troll fishery.

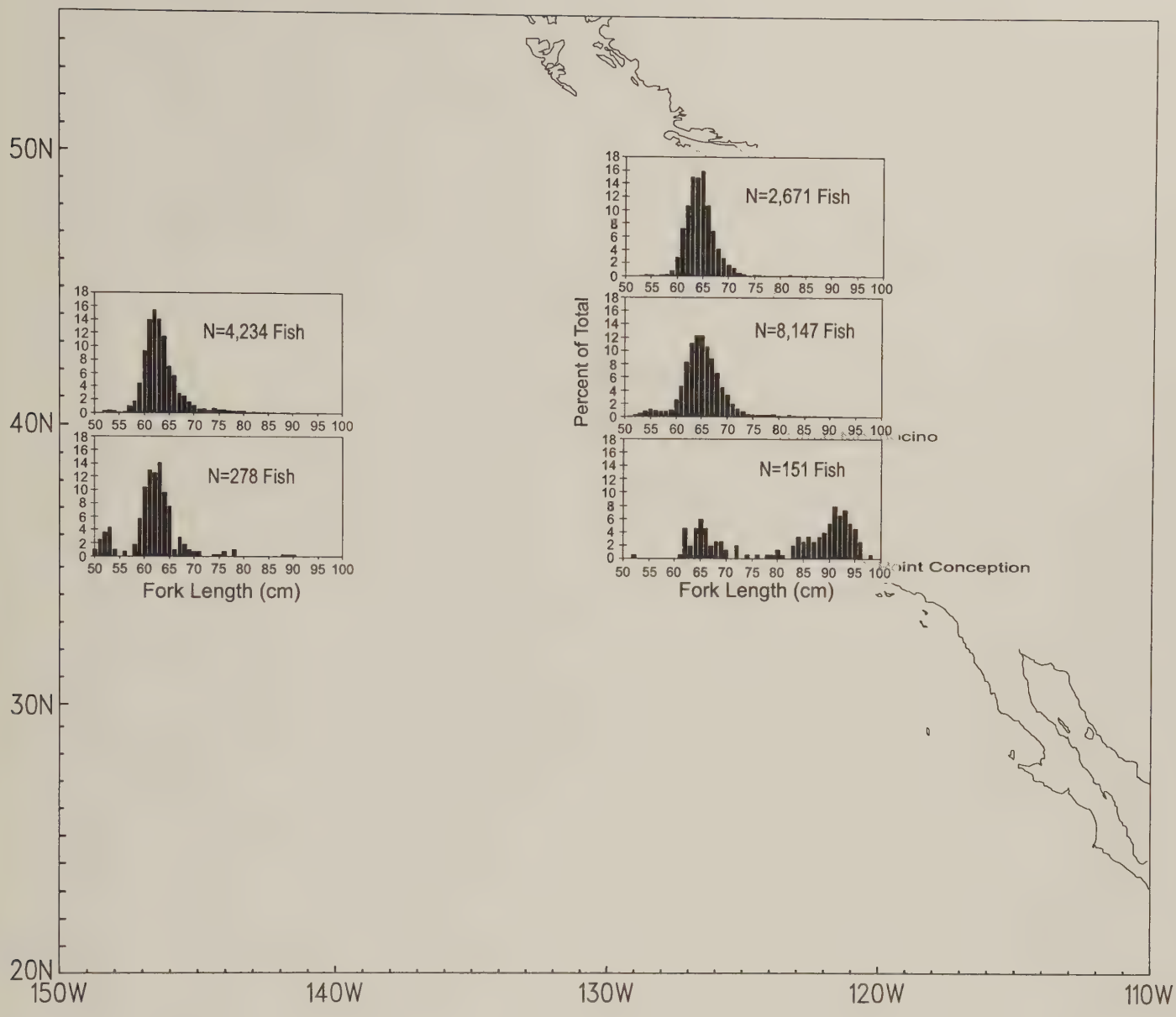

Figure 8. Continued.

Figure 8. (continued).

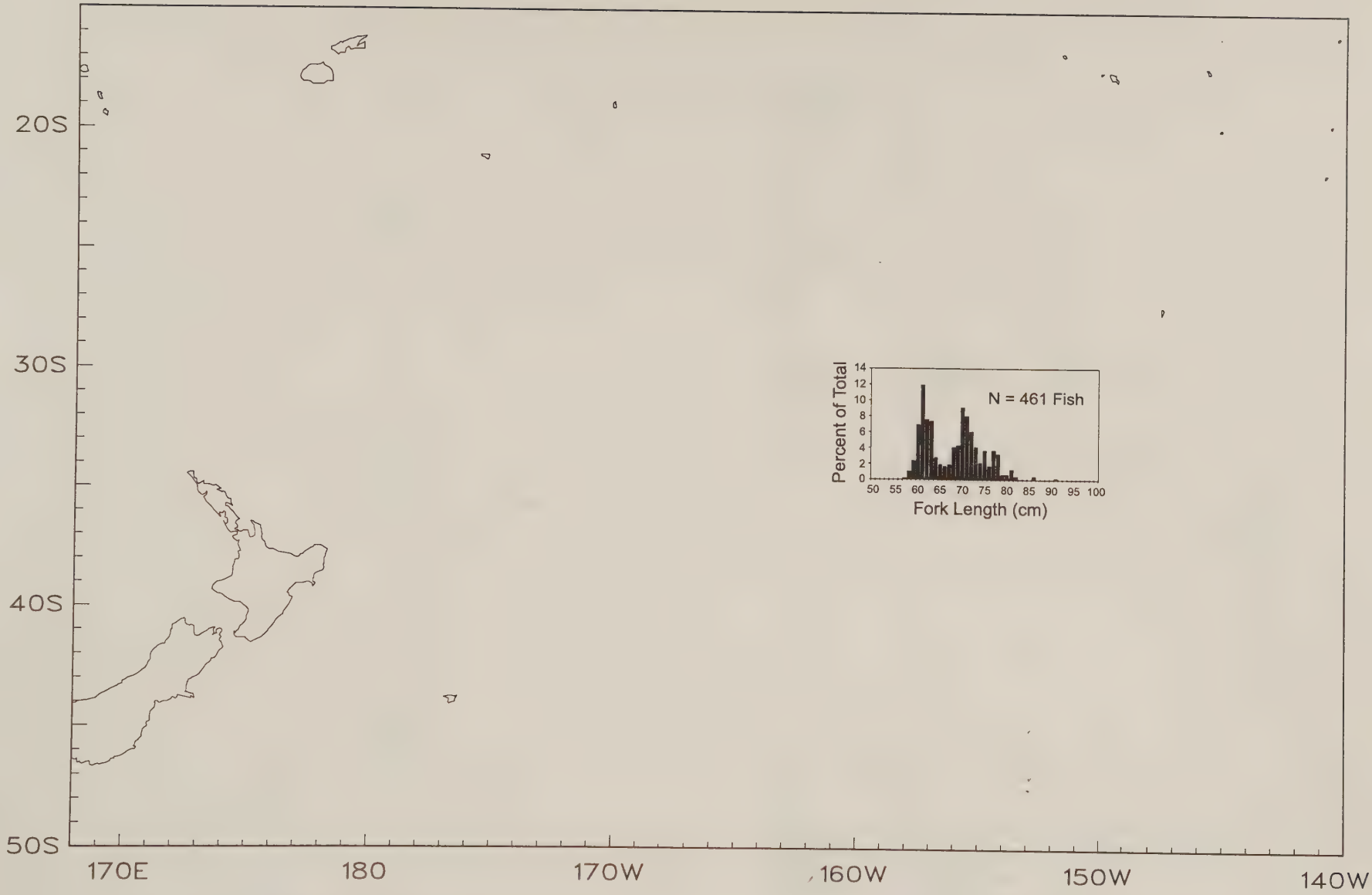

Figure 9. Geographic distribution of albacore length-frequencies from the 1995-96 South Pacific troll fishery.